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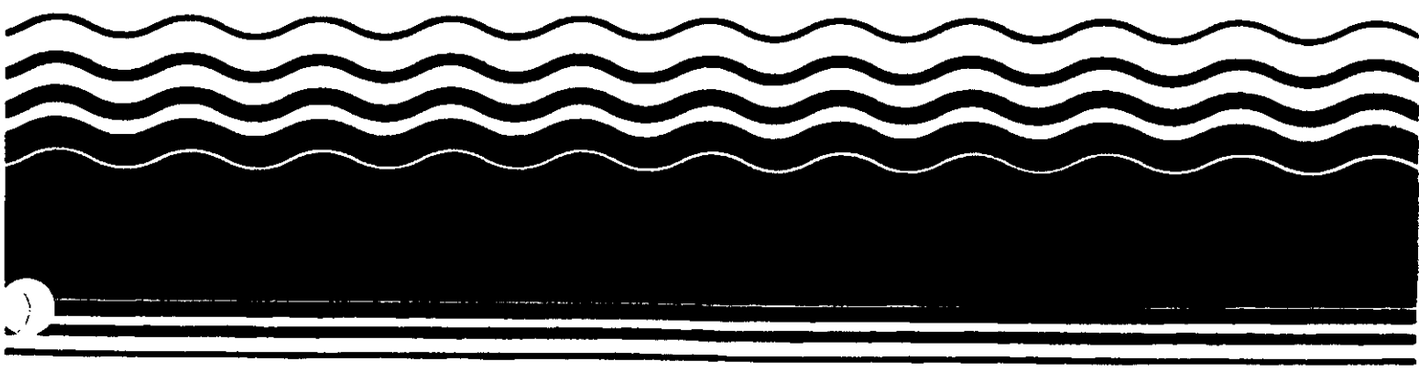
PB98-963122
EPA 541-R98-101
November 1998

EPA Superfund
Record of Decision Amendment:

Ott/Story/Cordova Chemical Co.
Dalton Township, MI
2/26/1998



DECLARATION FOR THE AMENDMENT TO THE RECORD OF DECISION

SITE NAME AND LOCATION

Ott/Story/Cordova Site
North Muskegon, Michigan

PURPOSE

This decision document presents the amendment to the Record of Decision (ROD) for Operable Unit (O.U.) #3 at the Ott/Story/ Cordova Site (the "Site") in Muskegon, MI, chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the National Contingency Plan (NCP).

BASIS

The decision to amend the ROD is based upon the Administrative Record. Indexes attached to this ROD Amendment identify items that comprise the latest updates to the Administrative Record upon which the amendment of the O.U. #3 Remedial Action is based.

DESCRIPTION OF THE AMENDMENT

On September 27, 1993 a ROD was signed for the O.U. #3 Remedial Action choosing Low Temperature Thermal Desorption (LTTD) to treat contaminated plant area soils and sediments in Little Bear Creek and its unnamed tributary. The remedy required excavation and LTTD treatment of contaminated soils/sediments, backfilling of adequately treated soils, and off-Site disposal of residue not attaining acceptable cleanup criteria. That Remedial Action was consistent with the previous two remedies selected for the Site.

This amendment to the ROD:

- eliminates LTTD from the remedy,
- revises the volume of soils to be remediated by excavation and off-site disposal as a result of an understanding that the land use for the site will remain industrial instead of residential as provided for in the 1993 ROD;
- requires regular sampling of surface water and sediments to determine the need for remedial action in the Little Bear Creek, and
- requires deed restrictions to insure that use of the site remains industrial.

This ROD amendment is being issued to reflect new information concerning the reasonably anticipated future land use of the site, which, in turn, affects the level of risk estimated as a result of site contamination. In addition, the State of Michigan revised its cleanup levels in 1995, which resulted in a reduction in the volume of soil requiring remediation at the Site.

Finally, based on information acquired after the 1993 ROD, U.S. EPA believes that a high potential for re-contamination of treated soils by contaminated groundwater would remain under the original remedy, thereby calling into question the effectiveness of on-Site disposal. After evaluating remediation goals of the OU#3 ROD and reasonable future land use, U.S. EPA believes it is more feasible to restore the Site for future industrial or commercial use rather than residential.

The goal of this amended remedy is to eliminate the primary human health risks posed by direct contact with contaminated soils, to eliminate the threat to the environment, and to reduce pump and treat activity by removing the groundwater contamination source embodied by O.U. #3 soils. This amendment to the O.U. #3 is consistent with past Remedial Actions and is expected to be consistent with potential future Remedial Action.

STATUTORY DETERMINATIONS

This amended remedy is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the Remedial Action, and is cost effective. Because soil constituting the primary risk at the Site does not contain principal threat waste, this remedy does not require treatment. This remedy will result in hazardous substances remaining on Site, requiring a review every five years after the start of Remedial Action to assure that the selected remedy remains protective of human health and the environment.

The State of Michigan concurs with the amended remedy put forth in this document.

2/26/98
Date

Wm. E. Muno
William E. Muno, Director
Superfund Division

DECISION SUMMARY FOR THE AMENDMENT TO THE RECORD OF DECISION FOR OPERABLE UNIT #3 OF THE OTT/STORY/CORDOVA SUPERFUND SITE MUSKEGON, MICHIGAN

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DECISION SUMMARY FOR THE AMENDMENT TO THE RECORD OF DECISION FOR OPERABLE UNIT #3 OF THE OTT/STORY/CORDOVA SUPERFUND SITE MUSKEGON, MICHIGAN

I. INTRODUCTION

The purpose of this document is to explain fundamental changes in the Remedial Action (RA) selected by the U.S. Environmental Protection Agency (U.S. EPA) in the Record of Decision (ROD) signed on September 23, 1993 for Operable Unit (O.U.) #3 for the Ott/Story/Cordova Site (the "Site") located at 500 Agard Road, Dalton Township, Muskegon County, Michigan (see Figures 1 and 2). The former production area, where the majority of the contaminated soils to be remediated are located, is approximately 20 acres in size and surrounded by wooded land and a rural residential area. Little Bear Creek (the "Creek") and its unnamed tributary are located about one-half mile east of the Site (see Figure 2).

U.S. EPA has re-evaluated O.U. #3 remediation goals and considers it reasonable to restore the Site to a level of protectiveness acceptable for industrial land use, which is the current land use at the Site. It is also reasonable to expect that future land use will continue to be industrial. Also, after the O.U. #3 ROD was signed, the State of Michigan (the "State") issued revised environmental statutes and cleanup standards in keeping with reasonable future land use that resulted in a reduction of soil requiring remediation. These considerations have allowed for a reduction in the volume of soils to be addressed by this remedy. The presence of the compound Dioxin in some Site soils precluded treatment in the LTTD unit based on concerns with air quality, further reducing the viability of the previously selected remedy. Finally, U.S. EPA believes that a high potential for re-contamination of treated soils by contaminated groundwater would occur under the original remedy, thereby calling into question the effectiveness of LTTD and subsequent on-Site disposal of treated materials.

Under CERCLA § 117 and Section 300.435(c)(2)(ii) of the National Contingency Plan (NCP), the lead agency is required to propose an amendment to the ROD ("ROD Amendment") and allow the public the opportunity to comment on the proposed changes if differences in the remedial action alter the basic features of the ROD. A public meeting for the original ROD was held on April 20, 1993. A notice of availability of the administrative record and new proposed plan for this ROD Amendment was published in the Muskegon Chronicle on May 27, 1997, commencing a public comment period from May 27 through June 25, 1997. In addition, a public meeting to discuss the new proposed plan was held on June 3, 1997 at the Dalton Township Hall. U.S. EPA responses to comments

received during this period and from the meeting are contained in a Responsiveness Summary, attached to this ROD Amendment.

This ROD Amendment and all other Site related documents are part of the Administrative Record File which is available for public inspection at the following locations:

Walker Branch Library
1522 Ruddiman Drive
Muskegon, Michigan

Dalton Township Hall
1616 East Riley Thompson Road
Dalton, Michigan

The Administrative Record may also be reviewed at:

U.S. EPA Region 5
77 West Jackson Boulevard
Chicago, Illinois

The lead agency for the remedial action at this site is the U.S. EPA. The State of Michigan Department of Environmental Quality (MDEQ) is the support agency. The Agencies encourage the public to review these and other documents to gain a better understanding of the Site.

This ROD Amendment provides an updated list of soil cleanup criteria, discusses the extent of plant area and sediment contamination at the Site, the scope of necessary excavation activity, and several options (including cost) for off-Site disposal. This is followed by a description of the amended remedy and an analysis of how the proposed new remedy meets the statutory criteria provided in Section 121 of CERCLA.

A. Site History

The Ott/Story/Cordova Superfund site is a former organic chemical production facility that operated under a series of owners from 1957 until 1985. Unlined seepage lagoons were used during many years of site operations for disposal of both industrial wastewaters and residuals from chemical production vessel cleanout. These disposal practices resulted in contamination of: an aquifer below and downgradient of the Site, Site soils, and nearby Little Bear Creek and its unnamed tributary. In addition, thousands of drums of waste material, some of which contained phosgene gas in pressurized containers, were stockpiled on-Site.

A partial removal was conducted between 1977 and 1979 by MDEQ (then the Michigan Department of Natural Resources, or MDNR), with the assistance of the new and present Site owner Cordova Chemical Company. These activities included the removal of stockpiled drums and thousands of cubic yards of contaminated soils and sludge. By the time of the removal, a contaminant plume containing at least 40 organic chemicals had migrated

approximately one mile off-site to the southeast, contaminating Little Bear Creek, an unnamed tributary, and several private wells. Residents were supplied with bottled water until a municipal water system was installed.

The Site was placed on the National Priorities List (NPL) in 1982 and U.S. EPA completed a Remedial Investigation and Feasibility Study (RI/FS) in 1990. A ROD for O.U. #1 signed on September 29, 1989 and affirmed on March 3, 1990, specified Site groundwater containment by extraction to prevent groundwater discharge to the Creek. A ROD for O.U. #2 was signed on September 29, 1990 and required restoration of the aquifer through additional extraction and treatment by a Groundwater Treatment Plant (GWTP). On September 27, 1993, U.S. EPA signed the third ROD selecting LTTD as the remedy for contaminated soils and sediment at the Site. U.S. EPA, using an Interagency Agreement, contracted with the U.S. Army Corps of Engineers (USACE) to design and construct all three operable units. GWTP construction was substantially complete in August 1996 and is currently operating and meeting all effluent discharge standards.

This ROD Amendment modifies the O.U. #3 ROD by eliminating LTTD as a treatment remedy for the Site based on information from initial attempts at LTTD implementation, the USACE Remedial Design (RD) for the LTTD remedy, subsequent technical documents summarizing additional sampling and analysis, and the RI/FS for the Site. Information contained in these documents indicates that LTTD will not be a cost effective remedy due to the reduced volume of soils to be treated, the increases in post-ROD cost estimates, modification of Site cleanup standards due to re-evaluation of future land use and associated remediation goals, and the potential for re-contamination of treated soils by contaminated groundwater that would occur.

B. Summary of Site Contaminants

1. **Plant Area Soils**; Table 1 shows the type and maximum concentrations of contaminants discovered in O.U. #3 soil (Figure 3) by excavation area (noted as Areas A through S), and lists current cleanup standards in State law. Values shown in columns A through S represent the maximum concentration of contaminant that was discovered during Site studies, including RI/FS, RD, and other post-ROD sampling and analyses. As shown, all O.U. #3 excavation areas showed some Site-related contamination.

2. **Sediments**; Although not included in the RD for the LTTD remedy, the 1993 ROD allowed for excavation and treatment of Creek sediments with plant area soils. Table 2 shows the type and maximum concentration of contaminants discovered in the sediments of Little Bear Creek and its unnamed tributary

(Figure 4), and the State of Michigan Residential Direct Contact Values for soils. Although these soils direct contact values do not represent sediment cleanup standards they have been included for comparison purposes only and provide a gauge as to what may constitute a contaminant level unacceptable to an individual inadvertently exposed to the Creek. These standards are being referenced because definitive sediment standards have yet to be established.

A review of sediment contamination information by MDEQ Surface Water Quality Division personnel resulted in a recommendation to monitor the Creek and Creek sediment. Although the O.U. #3 ROD allowed the possibility of excavation and treatment of sediments, a final determination has not been made regarding the requirement for sediment removal. To that end, the LTTD Remedial Design did not include any excavation in the Creek area.

3. **Comparison to Acceptable State Standards**; Table 3 presents a summary of O.U. #3 soils that in 1988 and/or 1992 have been shown to be contaminated at concentrations in exceedance of current State standards. Areas that have shown exceedances based on historical data are Areas A, B, F, G, I, K, L, M, O, P, Q, and R. Results of subsequent sampling in 1994, 1995, and 1996 indicate that all areas except R have either no detections or detections at concentrations below acceptable State standards. In addition, Area G presented ecological risk by exhibiting highly toxic effects when subjected to biological testing. All information shown in Table 3 has been summarized in a document entitled "Technical Memorandum for Soil and Sediment at the Ott/Story/Cordova Superfund Site" dated April 1997. Data shown in Table 3 from more recent sampling and analysis events supersede historical data.

C. Summary of Site Risks

Table 4 summarizes all risks associated with O.U. #3 soils and sed...ents calculated for the O.U. #3 ROD. This ROD Amendment, however, requires a level of protectiveness for future industrial use for plant area soils and future residential use for the sediments of Little Bear Creek and its unnamed tributary, in accordance with reasonable future land use for the Site. Tables 4A through 4D are risk summaries consistent with future industrial, commercial, and residential users of the Site. These values take into account exposure to contaminated soils, sediments, surface water, air and groundwater. Residential risk values are included to demonstrate that unacceptable O.U. #3 risk is not attributable to Creek sediments. Current zoning of the Site, deed restrictions, and Site security will increase the

likelihood that future exposure to the Site will only be through a controlled industrial scenario.

When the Hazard Index (HI) is greater than 1, there is a potential for health problems such as damage to vital organs, birth defects, and anemia and other blood disorders. A $1x10^{-6}$ cancer risk value corresponds to a 1 in 1,000,000 chance that an individual develops cancer as a result of exposure to these concentrations of contaminants over a period of 70 years. Similarly, 10^{-5} corresponds to a 1 in 100,000 chance, $1x10^{-4}$, 1 in 10,000, and so on. Current environmental statutes allow U.S. EPA to perform a Remedial Action if an HI is 1.0 or above and if cancer risks exceed $1x10^{-4}$. The State of Michigan is required to take action at an HI of 1.0 or above and cancer risk of $1x10^{-5}$ or greater.

As shown in Table 4, the greatest risks associated with O.U. #3 are to a future resident ($3x10^{-4}$; HI of 2.4) and future worker ($1x10^{-4}$). Consideration of all the contaminants found on-Site results in the greatest risk to a future Site worker ($1.52x10^{-4}$), a future maintenance worker ($2.0x10^{-4}$), and a future resident ($5.81x10^{-4}$).

Risk values shown in Table 4E consider the likelihood of a future Site resident or visitor being exposed to both plant area soils and/or Creek water and sediments. As shown, unacceptable risk (HI of 1.44) exists for a resident due to the compound 4,4'-DDT. This compound, however, has not been detected in recent Creek sediment and surface water sampling (December 1996, March 1997).

Site specific leachability testing of soils (which is discussed in more detail on page 12 and 13 of this document) indicate that soil contaminants in some areas of the Site present an unacceptable risk due to the potential to migrate to groundwater. In addition, toxicity testing suggests these contaminants present an adverse ecological impact (i.e., the lack of vegetation).

II. REASONS FOR ISSUING THE ROD AMENDMENT

A. Steps Taken to Implement the Current Remedy

The O.U. #3 ROD selected LTTD as the remedy for contaminated Site soils and sediments at the Site. An LTTD unit was to be situated on-Site to thermally treat excavated contaminated soils and sediments. Treated soil and other LTTD residue with contamination exceeding acceptable State of Michigan standards would have been disposed of off-Site in a licensed landfill and acceptably treated soils would have been used as back-fill in excavated areas.

In February 1994, approximately five (5) months after the O.U. #3 ROD was issued, USACE began the O.U. #3 Remedial Design to determine locations, areas, and depths of soils and sediments to be excavated and treated. In addition, the RD would provide LTTD treatability characteristics by quantifying types and concentration of contaminants in soils. In April 1995, the 30% Design (Pre-Design) Report was issued which delineated those areas of the Site requiring excavation.

Concurrent with development of the RD in early 1995, the decision was made by U.S. EPA to have USACE utilize the Rapid/Immediate Response Procurement Procedure, avoiding the time-consuming competitive acquisition process. This decision was justified because the U.S. Government competitive acquisition process would delay Site construction activity for at least 1 year, due to the length of the competitive bidding process and the resultant loss of seasonable weather for construction. On May 21, 1995, USACE provided a notice to proceed to a LTTD contractor.

In June 1995, the State of Michigan issued changes to their cleanup standards due to legislative amendments to Part 201 of the Natural Resources and Environmental Protection Act (NREPA), 1994 PA 451 ("Part 201"), which governed these standards. Shortly after, U.S. EPA was petitioned to review the O.U. #3 remedy decision and consider the effectiveness of the LTTD remedy. Based upon a review of Part 201 and consideration of anticipated industrial future land use at the Site, the possibility developed for a significant decrease in the volume of soil to be treated.

The cost effectiveness of LTTD was questioned given increases shown in post-ROD cost estimates and the fact that contaminated groundwater could permeate treated areas during periods of increased groundwater levels, potentially 're-polluting' clean soils. Continued expenditure for LTTD would not have been appropriate compared to excavation and back filling without treatment. Potential for 're-pollution' exists for either alternative and it was decided to suspend the LTTD remedy in July 1995 as a cost saving measure.

Shortly after this decision, U.S. EPA proceeded to reconsider the anticipated land use for the Site and the degree of remediation needed for all areas shown in Figure 3. This reconsideration was based on reasonable future land use and the flexibility allowed by the newly revised State of Michigan environmental law. Additional sampling and analysis was completed to determine the threats posed by the contaminated plant area soils. Even though risks attributable to O.U. #3 soils remained at levels requiring Remedial Action, U.S. EPA compared new and historical data (including soils leachability tests) against allowable State of Michigan soils Direct Contact Values (cleanup standards) and considered the degree of additional burden that contaminated

soils are adding to Site groundwater. This was also consistent with Federal and State guidance that notes the propensity for leaching determines the risk involved with contaminated soil and should be considered when developing remediation plans. Because contamination in O.U. #3 soils, however, largely remain at concentrations identical to those at the time of the ROD, risks as identified in Table 4 are still present, requiring Remedial Action by U.S. EPA.

Original cleanup standards cited in the O.U. #3 ROD were for residential use of Site groundwater and soils. After completion of the RD, consideration of post-ROD sampling data, and the relatively remote and industrial nature of the Site, U.S. EPA believes that soil cleanup standards consistent with future industrial or commercial land use are more appropriate.

B. Supporting Information For the Fundamental Change

1. **Shallow Depth of Groundwater;** Studies completed during the RI demonstrate that Site groundwater is present on Site at relatively shallow depths, ranging approximately 5 to 15 feet below ground surface. Soil sampling and well installation showed the lack of well defined stratigraphic layers, resulting in similarity in material properties and bedding patterns throughout the depth of the groundwater aquifer. No distinct aquifer confining layer was discovered above a depth of approximately 130 feet, at which a bedrock layer is known to exist.

   In excavation areas F and G, groundwater was discovered at a depth of 2.5 feet below grade during RI soils sampling in March 1988. In general, RI activity discovered groundwater at depths ranging from 2 feet below grade to 5.5 feet, in all Site areas depicted in Figure 3. These shallow depths were confirmed when monitoring wells were installed. In January 1992, U.S. EPA supplemented 1988-89 Site studies and discovered that soils were wet between 3 and 5 feet below grade as well as standing water in several instances.

   In October 1994 to better define excavation areas as part of the LTTD RD, U.S. EPA performed additional soils sampling. In June and July 1995, confirmatory sampling and analysis was performed by the Site owner. By that time, these additional studies provided accessory groundwater depth information because it was fairly well known that the aquifer exists at average depths between 3 and 5 feet throughout the O.U. #3 area. Shallow groundwater depth may make excavation and back-filling of excavated areas with clean material counter-productive because of the high potential for contaminated groundwater to re-contaminate clean soil.

2. **Increase in LTTD Cost Estimates:** The September 1993 ROD cited a present worth cost (including annual operation and maintenance ("O&M") costs over 30 years) of approximately $6,900,000 for the LTTD remedy. The March 1995 final design cost estimate calculated a capital cost (not including annual O&M costs) of approximately $12,200,000, not including excavation and treatment of sediments. Considering the potential for re-contamination with any excavation activity and the significant increase in the anticipated cost of LTTD, proceeding with on-Site treatment of soils and sediments was determined not to be cost effective.

3. **Changes to Land Use and State of Michigan Cleanup Standards:** Changes to the State of Michigan cleanup standards (based on a reconsideration of the anticipated future land use at the Site) results in a decrease in the number of soil areas and therefore the volume of soils requiring remediation. Several months after completion of the O.U. #3 LTTD RD, the State of Michigan promulgated new soil cleanup standards that provided for more flexibility in considering reasonable future land use than those in effect at the time of the O.U. #3 ROD. Michigan Act 307 (formerly known as the Michigan Environmental Response Act) was in effect for remedial actions at the time of the 1993 ROD and has since been largely replaced by Part 201 of the Natural Resources and Environmental Protection Act (NREPA), 1994 PA 451, as amended ("Part 201").

   Part 201 requires that a remedial action achieve generic limited categorical cleanup standards, such as residential, commercial, or industrial. The 1993 ROD specified that the LTTD remedy would seek to comply with Act 307 Type B cleanup goals which were based on a residential human exposure risk of 10^{-6}. A major change that resulted with the enactment of Part 201 is the consideration of future land use and the establishment of a target risk level of 10^{-5} for remediation efforts.

   Part 201 requires cleanup standards based on future land use (i.e., more realistic exposure scenarios) instead of "worst-case" possibilities. Rather than requiring residential soils direct contact standards be applied to the Site because of the possibility of future residential use, standards for future industrial land use are more appropriate given the industrial history of the Site and the current zoning of the land for industrial use.

4. **Decrease in Creek Contaminants Due To O.U.#1 & #2 Operation:** Tables 5A and 5B provide an example of the decrease in Creek contamination that has occurred since initiation of the

O.U. #1 and #2 groundwater extraction and treatment remedies. O.U. #1 and #2 extraction wells are intended to intercept contaminated groundwater before reaching the Creek, serving to remove the source of Creek contamination. Pre-1996 sampling found contaminants in the Creek at levels below State of Michigan residential direct contact standards for soil. The further reduction of these contaminants suggests that the O.U. #1 and #2 remedies are successful in inhibiting Site contamination from reaching the Creek.

Reduction in Creek contaminants has allowed U.S. EPA to suspend the excavation of Creek sediments. Implementing Creek excavation at this time is not recommended because there may be unforeseen long term intrusive effects on the natural Creek system. Additional monitoring must be performed for U.S. EPA to effectively develop the best approach to management of contamination at the Creek. This information is also necessary to adequately determine the effectiveness of the O.U. #1 and #2 system. The groundwater treatment plant has not yet been able to achieve full design capacity, meaning Creek data to date is not quite fully representative.

Suspension of sediments excavation activity at this time does not preclude U.S. EPA from performing any Creek remediation at a later date, but may result in attenuation of the Creek without disturbing the natural system.

III. SELECTION AND DESCRIPTION OF THE FUNDAMENTAL CHANGE

U.S. EPA defines principal threat wastes as "...[S]ource materials considered highly toxic or mobile that...would present a significant risk to human health or the environment should exposure occur." In general, CERCLA contains a preference for treatment of the principal threats to the maximum extent practicable. Although risk attributed to direct contact with O.U. #3 soils for industrial land use is at a level requiring Remedial Action, mobile or highly toxic contaminants found in O.U. #3 soils are not at concentrations high enough for this material to be classified as principal threat waste.

An LTTD treatment remedy is also not cost-effective because of the small volume of soils posing unacceptable risk from the direct contact threat. This volume has been reduced due to the revised State of Michigan requirements that allow reconsideration of anticipated land use and the associated cleanup standards for future industrial land use. Most O.U. #3 soils do not present any direct contact risk or act as a source of additional groundwater contamination. This smaller volume of soil reinstates the practicability of off-Site disposal alternatives.

Table 6 summarizes remedial alternatives considered in the O.U. #3 ROD. Except for the 'no action' and 'institutional control' alternatives, a common component of all these options is excavation of the O.U. #3 soils. Conclusions put forth in the O.U. #3 ROD in the nine criteria alternatives analysis continue to be valid. The 'no action' and 'institutional control' alternatives (Alts. 1 and 2) are not acceptable as they do not provide overall protection of human health and the environment and would not comply with ARARs. Alternative 6 is the LTTD remedy that was selected.

There were three alternatives discussed in the O.U. #3 ROD that included construction of an on-Site landfill. Alternative 3a and 3b varied only in the degree of containment determined by landfill construction requirements for hazardous (Michigan Act 64) and non-hazardous (Michigan Act 641) wastes. Alternative 7 required construction of an on-Site landfill, coupled with some off-Site treatment of a limited volume of O.U. #3 soils and Little Bear Creek sediments. Although these three alternatives provided an adequate balance of the nine remedy selection criteria, none of them were selected due to their higher costs when compared against the LTTD remedy.

The remaining Alternatives (Alt's. 4 and 5) are excavation and off-Site landfilling and incineration, respectively. The intent of this O.U. #3 Remedial Action is to remove the threat to human health and the environment as quickly as possible and in the most cost effective manner. Given the small volume of soil containing unacceptable risk, the consequent impracticality of treatment, and the ease of implementation of these disposal options, this ROD Amendment limits its nine criteria analysis to Alternatives 4 and 5.

Treatment of soils using technology other than thermal was re-considered during the compilation of this ROD Amendment. The detailed analysis of available treatment technologies contained in the FS and O.U. #3 ROD remains valid. They are not cost effective for the smaller soil volume, and the potential for post-treatment re-contamination is identical to that for any non-treatment alternative.

A. <u>Plant Area Soils - The Fundamental Change</u>

In 1995, shortly after implementation of the LTTD remedy was halted, additional sampling and analysis of O.U. #3 soils was performed, including leachability and toxicity tests. A re-evaluation of all Site data was also performed. It was then determined that three contaminated soil areas of O.U. #3 may require remediation based on high leachability potential and/or potential risk to human health or the environment. Table 3 summarizes the conclusions of this re-evaluation.

Unacceptable cumulative risks calculated for a future Site worker or future Site maintenance worker by direct contact with O.U. #3 soil is attributed to a number of contaminants (see Table 4), some of which were historically detected in Area F. Comparison of historical data for Area F against current State of Michigan 20 times industrial drinking water standards suggests a potential for contaminant exceedances of these standards. Even though later sampling of Area F showed no detections of Dioxin or leaching of contaminants at unacceptable levels, the history of previous incineration activities in this area suggests questionable handling and cleanup procedures and the possible presence of contamination at levels exceeding direct contact standards. This warrants further characterization and possible excavation of a portion of Area F soils. It is anticipated that during implementation of the amended O.U. #3 remedy, U.S. EPA will further characterize Area F and make a final determination as to the necessity and degree of excavation of soils in this area.

Soils in Area G exhibited highly toxic effects when subjected to biological testing. As noted in Table 3, Site studies have also shown exceedances of cleanup criteria. Specifically, historical data shows that current direct contact standards were exceeded for Methoxychlor, Endrin, PCBs, and the 20 times the drinking water standard was exceeded for bis (2-ethylhexyl) phthalate, 4-Chloroaniline, Aldrin, Hexachlorobenzene, and 4,4'-DDT. Leachability testing performed in 1995, however, showed that the contaminants present did not exhibit any tendency to leach. The lack of vegetation in this area combined with the results of biological testing suggests that remediation of this area is necessary for protection of the environment. In addition, the presence of 4,4'-DDT is a contributing factor for excavation of Area G soils.

Samples taken from Area R showed contaminants leaching from soils at concentrations in excess of State of Michigan industrial groundwater protective levels. Specifically, 20 times the drinking water standard was exceeded for the compound Tetrachloroethene. Historical exceedance of the 20 times drinking water standard was shown for the compounds 1,1,2-Trichloroethane, bis (2-ethylhexyl) phthalate, 1,2-Dichlorobenzene, 1,4-Dichlorobenzene, Hexachlorobenzene, Aldrin, 4,4'-DDT, and Arochlor 1248 (PCBs). Carbon Tetrachloride was discovered at a high concentration but not confirmed by later sampling. The exceedance noted for Tetrachloroethene warrants excavation of Area R. Other contributing factors include the discovery of drum remnants, documentation of soil and water discoloration during sampling events in the area, and the history of Area R as a former drum disposal area.

40 CFR Section 300.430 (e)(2)(I)(A) requires U.S. EPA to establish remediation goals based on ARARS and additional factors including "...(4) [F]actors related to uncertainty; and (5) [O]ther pertinent information." Former incineration and disposal activity in Areas F and R, and specific visual confirmation of stressed vegetation and results of Microtox testing (demonstrating an unacceptable threat to the environment) in Area G are contributing factors to the decision to excavate these areas.

Precise depths of excavation within Areas F, G, and R and associated soil volume to be disposed will be determined during implementation of the Remedial Action. It is presumed for the purposes of this ROD Amendment that soils will be excavated to a minimum depth of 1 foot and a maximum not exceeding either:

1. the depth at which contaminant concentrations meet State of Michigan Direct Contact Values for industrial land use, as promulgated by Section 20120A(1)(D) of Part 201 of the Natural Resources and Environmental Protection Act, P.A. 451 of 1994, as amended, or
2. the depth at which contaminants no longer leach from soil at concentrations in excess of State of Michigan 20 times drinking water standards for industrial land use, or
3. the depth at which groundwater is present, or
4. (for Area R) the depth necessary to remove any drums, lab debris, or other containerized wastes,

whichever is necessary. Contaminants of concern as identified in the 1993 ROD are shown in Table 1 as well as the cleanup criteria the amended O.U. #3 remedy is required to meet.

Based on Site hydrogeological and analytical information to date, the final excavation depths will not likely exceed 6 feet for any one area, and it is anticipated that the volume of soils actually excavated will be approximately 4,000 cubic yards (yd^3). The 1993 ROD was based on an estimate of 7,200 yd^3 of contaminated soil to be treated. A final determination as to the quantities and disposal fate of excavated soils can not be made until the material is sampled and analyzed. Excavated material will be composited within each excavation area, contained, sampled, and analyzed to determine the final requirements for disposal.

All excavation spoils will be disposed of in accordance with all applicable Federal and State laws. Because specific information on the origins of the contamination on Site is not available, excavated O.U. #3 soils are not assumed to be RCRA listed waste. However, hazardous constituents have been detected in these soils, suggesting that excavated material can potentially be RCRA characteristic waste. If excavated material contains hazardous constituents in excess of RCRA Land Disposal Restriction (LDR) treatment standards, the soils will be treated off-Site at a licensed facility. Similarly, if Dioxin is detected in excavated

soils at a concentration in excess of the RCRA LDR Universal Treatment Standard of 1 ppb, the Dioxin contaminated soils will be incinerated in an off-Site incinerator permitted for Dioxin waste. Cost allowances and contingencies included in this ROD Amendment and existing Remedial Action funds obligated for the LTTD remedy are adequate for whatever disposal option is required.

Analytical data for O.U. #3 soils (including Toxicity Characteristic Leaching Procedure (TCLP), Synthetic Precipitation Leaching Procedure (SPLP), and the ASTM Neutral Leach Test) strongly suggests that excavated soils will not demonstrate RCRA characteristics in excess of LDR standards. It is therefore anticipated that it will be possible to dispose of all of the estimated 4,000 yd^3 in a RCRA Subtitle D landfill. The cost estimate for this amended remedy is based on a "worst-case" disposal requirement, but U.S. EPA will utilize the most cost effective option possible.

What will remain after completion of the amended remedy are marginally contaminated soils covered with a 1 to 3 foot depth of clean soil. If anyone were to perform any future excavation, soils 1 to 3 feet below grade may present a 1 in 100,000 chance of an individual developing cancer if that individual performs industrial work on the Site for 70 years. U.S. EPA is required to perform a Remedial Action when the cancer risk is 1 in 10,000 or worse (1 in 1,000, 1 in 100, etc.). In accordance with current regulations, the acceptable range of risk is between 1 in 10,000 (10^{-4}) and 1 in 1,000,000 (10^{-6}) over a 70 year life time.

As discussed in Section I.C - Summary of Site Risks, the risk calculated for O.U. #3 and the leachability and/or eco-toxicity of some Site soils indicate that an unacceptable risk to human health and the environment exists at the Site.

B. <u>Capping and 'Post-Excavation' Fill</u>

Soil presenting a direct contact threat in Areas F and G can not be left in place because of potential risk involved with excavation for industrial construction or maintenance activity. At this point in time, capping of Area R in place without excavation is not an acceptable option due to leaching of contaminants from soils into groundwater underneath.

Excavated areas will be back filled with clean native soils. Because no standing water can be allowed to accumulate in excavated areas, those areas must be filled to a level greater than the seasonal groundwater peak. That level may be as shallow as 1 or 2 feet below grade resulting in grades very close to current levels. In the event that clean fill is affected by rising groundwater, soil closest to the surface (above the

seasonal groundwater peak) will remain clean and will serve as protection against direct contact with subsurface contamination. Construction details will be established in the field, after excavation begins and appropriate sampling and analysis of underlying soils has occurred. The source of soil or clay used for fill will either be off-Site or from Site areas characterized as clean which will not interfere with past or future Site Remedial Action.

C. **Sediments**

As previously mentioned, operation of the O.U. #1 and #2 groundwater extraction and treatment systems may allow natural attenuation of sediments in Little Bear Creek and its unnamed tributary. Table 2 lists State of Michigan Residential Direct Contact Values for soil. Although these standards were not developed specifically for sediments, they have been included in Table 2 because:

- no sediments cleanup standards exist,
- residents may come in contact with Creek sediment during recreational use, and
- surface water is in constant contact with sediment.

These soil standards provide a starting point against which attenuation may be measured. Creek monitoring will measure contaminant decrease and the level of protectiveness in the Creek will be assessed at least every five years. Monitoring data will be compared against sediment standards as soon as sediment standards are developed. It is anticipated that contaminant concentrations will continue to decrease over time and that this Site remedy will remain protective into the future.

Because:

- the source for contamination of these sediments (discharge of contaminated groundwater) appears to be contained by the O.U. #1 and #2 remedies,
- the MDEQ SWQD has recommended Creek and sediment monitoring,
- unacceptable residential risks shown in Tables 4 through 4E are not attributable to contaminants found in sediments or surface (Creek) water, and
- the threat posed by contaminated drinking water has been addressed by connection of nearby residents to the Muskegon County water system,

there is no immediate need for removal of these sediments. A Creek and sediment monitoring program will be implemented for a time period long enough to make an accurate assessment of O.U. #1 and #2 effectiveness and the condition of the Creek system. At least three years of quarterly Creek and sediment monitoring will likely be completed before an assessment of contaminant attenuation can be made. In addition, biological toxicity tests will likely occur after the second and third years.

D. Deed Restrictions

The anticipated future land use of the Site is industrial. Current zoning established by Dalton Township requires that the Site can only be used for industrial use. In order to enhance the likelihood and insure that future land use at the former Plant Area of the Site remains industrial in nature, an appropriate notice or deed restriction will be recorded on the title to the real estate on which the Site is located. Legal activity involving current and past owners and operators of the Site is now occurring and may involve transfer of title to the property to a government entity at which time the appropriate notice or deed restriction will be placed on the title. Because of this activity, a final determination as to the ultimate ownership of the Site can not be made at this time. Provision has been made in the cost estimate included in this ROD Amendment for the implementation of deed restrictions.

IV. NINE CRITERIA ANALYSIS OF THE REMEDY CHANGE

A. THE NINE CRITERIA

U.S. EPA is required to perform an analysis whereby each remedial alternative is weighed relative to the following criteria:

THRESHOLD CRITERIA

1. **Overall Protection of Human Health and the Environment** determines whether the alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.

2. **Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)** evaluates whether the alternative meets Federal and State environmental statutes, regulations, and other requirements that pertain to the Site.

PRIMARY BALANCING CRITERIA

3. **Long Term Effectiveness and Permanence** considers the ability of the alternative to protect human health and the environment over time and the reliability of such protection, including the degree of certainty that the alternative will prove successful.

4. **Reduction of Contaminant Toxicity, Mobility, or Volume Through Treatment** evaluates the alternative's

effectiveness in reduction of the harmful effects of principal contaminants, reduction of the contaminants' ability to move in the environment, and the reduction in amount of contamination present.

5. **Short Term Effectiveness** considers the length of time needed to implement the alternative and the risks the alternative poses to workers, residents, and the environment during implementation.

6. **Implementability** considers the technical and administrative feasibility of implementing the alternative, such as the practicability and difficulty of construction, and the availability of goods and services.

7. **Cost** considers the estimated capital and operation and maintenance costs, as well as present net worth costs. Present net worth is the total cost of the alternative over time in terms of today's dollars.

MODIFYING CRITERIA

8. **State Acceptance** considers whether the State agrees with U.S. EPA's analyses and recommendations of the studies and evaluations performed.

9. **Community Acceptance** has been determined from the public comment period associated with the Proposed Plan.

B. NINE CRITERIA ANALYSIS OF THE PREFERRED AMENDED REMEDY

Evaluation of the original seven alternatives against the nine criteria was performed for the O.U. #3 ROD and is summarized in Table 6. Alternatives were re-visited for this ROD Amendment and their compliance with the nine criteria are briefly discussed. This ROD Amendment will refer to original Alternatives in the same order as the 1993 ROD, with the two excavation and disposal options being Alternatives 4 and 5 (excavation and off-Site landfilling and incineration, respectively). A re-evaluation of these two off-Site alternatives follows, including highlights of the original nine criteria analysis performed for the 1993 ROD.

THRESHOLD CRITERIA

1. **Overall Protection of Human Health and the Environment**: Both Alternative 4 and 5 are protective of human health and the environment because contaminated soils constituting the

O.U. #3 human direct contact threat or a threat to the environment will be removed pursuant to acceptable State soil cleanup criteria for an industrial land use. The 'no action' and 'institutional control' alternatives (Alt's. 1 and 2) originally presented in the 1993 ROD did not and still do not meet this criterion, and consequently were not re-considered for this ROD Amendment. Alternatives 3a, 3b, 6, and 7 met this criterion and would continue to achieve protection of human health and the environment.

2. **Compliance with ARARs**; With the exception of those related to operation of thermal treatment equipment, requirements of ARARs as identified in the O.U. #3 ROD remain applicable. Federal ARARs identified have not changed since the O.U. #3 ROD. With the exception of Part 201 changes (formerly Act 307 as noted above), substantive requirements of State ARARs are essentially unchanged, but may be identified differently. Appendix A is a detailed discussion of ARARs for the Site.

As noted in the O.U. #3 ROD, all Alternatives except for the 'no action' (Alternative #1) and 'institutional control / deed restriction' (Alternative #2) would have complied with all ARARs identified, provided appropriate soils characterization and engineering controls are implemented during remedy construction.

Alternative #4 will comply with these ARARs provided that appropriate controls are applied for dust and emissions control, and the destination for excavated soils complies with all land use and disposal statutes and regulations. This includes disposal in an off-Site incineration facility for selected excavated material if necessary. Specific requirements of Part 201 that Alternative #4 must comply with are the industrial direct contact and groundwater protection standards, summarized in Table 1.

Residual contamination after completion of the amended O.U. #3 remedy precludes future residential development for the Site. The Site constitutes an inactive or abandoned site whose primary activity was industrial in nature and as such can continue to be classified as industrial. U.S. EPA foresees that appropriate recorded notices on the title to the Site property and deed restrictions combined with security measures will be adequate to prevent or limit the exposure potential for nearby residents and insure the Site is not used for anything except industrial activity. Thus, Part 201 industrial cleanup criteria would be the relevant ARAR.

PRIMARY BALANCING CRITERIA

3. **Long-Term Effectiveness and Permanence:** At the time of the 1993 ROD, Alternative 4 represented U.S. EPA's least preferred option in because it requires off-Site landfilling. Landfilling requires continual monitoring and maintenance to insure adequate containment of hazardous materials, making landfilling an impermanent solution. Although impermanent, however, landfill technology has been reliably utilized for many years. In addition, the containment options proposed in the O.U. #3 ROD guarantee that contamination source material would remain out of contact with Site groundwater. These considerations suggest that all Alternatives except 1 and 2 offer a good degree of long term effectiveness and permanence.

Overall, the treatment Alternatives 5 and 6 were the most desirable with regard to long term effectiveness and permanence due to the finality afforded by thermal treatment. Although Alternatives 5, 6, and to some degree 7 continue to offer the greatest degree of initial permanence in that they would provide destruction of contaminants, the potential for re-contamination of treated soils by contaminated groundwater reduces the long term effectiveness and cost effectiveness of these Alternatives.

Considering the information that suggests potential re-contamination of treated soils, the State's cleanup standards based on industrial future land use, and the consequent reduction in volume of contaminated soils requiring removal, the degree of effectiveness of Alternatives 5, 6, and 7 now appear to be reduced to a level closer to that of Alternative 4.

Removal of the most highly contaminated soils in the O.U. #3 area immediately eliminates the direct contact risk threat associated with exposure to contaminated surface soils. All Alternatives remove a great portion of source material, thus offering a good degree of permanence and long term effectiveness with regard to treatment of Site groundwater.

It is these considerations within this remedy selection criterion that suggest that, except for Alternatives 1 and 2 (eliminated based on non compliance with Threshold Criteria), and Alternative 6 (eliminated for reasons already stated), all remaining Alternatives have comparable long term effectiveness and permanence.

4. **Reduction of Toxicity, Mobility, or Volume through Treatment:** Alternative 5, off-Site incineration, remains the best option for satisfaction of this criterion.

Alternatives 6 and 7 which have treatment components achieve this criterion, but to a lesser degree. As previously noted, however, treatment is not cost effective for O.U. #3 areas. Alternatives 3a and 3b and certain portions of 7 do not achieve this criterion because they are containment technologies.

Although Alternative #4 would remediate the primary risks associated with the contaminants in the O.U. #3 soils, achievement of this criterion would not be realized because, for the majority of excavated material, there would be no treatment needed off-Site. Even though removal of the most highly contaminated soils (as in all Alternatives) may assist in the reduction of toxicity, mobility, and volume of contaminants going into groundwater and removed by the GWTP, this criterion would not be achieved for soil excavation and disposal.

This criterion would not be attained for most of the soils to be addressed by this amended O.U. #3 remedy. However, in the event concentrations of specific hazardous constituents within excavated material exceed substantive requirements of appropriate disposal standards, then a portion of excavated material may be disposed of at an approved incineration facility. For that portion of excavated material requiring incineration, this criterion is thus satisfied.

5. **Short-Term Effectiveness**; All Alternatives have a short term exposure potential during excavation and construction, transport, or treatment phases. Instituting proper health, safety, and emission control procedures will aid in minimizing such risk. Design specifications require that procedures should be developed and followed for dust control, erosion control, and personal safety, if deemed necessary.

If during construction activity, Site dust and/or emissions reach unacceptable levels, the nature, locations, and amount of Site activity will be reduced or adjusted accordingly. If discharges continue after such changes are implemented, physical means such as mist generation and application of foam cover (or other material) directly at the point of excavation may be utilized. At the end of each daily construction period, excavation and stockpile areas will be covered appropriately to prevent releases during off-hours. Based on the existing RD, however, it is expected that any dust and/or emissions can be controlled without such measures.

Elimination of on-Site thermal treatment as a component of this O.U. #3 remedy is expected to reduce overall short-term

impacts at the site. This will also reduce the time required to implement the remedial action at the Site.

In general, off-Site disposal is undesirable because of transportation of hazardous materials. Alternatives 3a, 3b, and portions of 7 thus continue to be more desirable than Alternatives 4 and 5 because of their retainage of hazardous materials on Site and no risk of exposure during transportation. Even though under CERCLA, however, off-Site disposal without treatment is a least preferred option, the drastic reduction in the amount of soils to be removed affords a shorter time period for their removal and thus improves the short term effectiveness of Alternatives 4 and 5. It is estimated that the amended O.U. #3 remedy will require no more than 1 year to complete, not including sampling and analysis of Little Bear Creek surface water and sediments, which will occur for a likely minimum of three years.

All Alternatives have a roughly equivalent short term exposure potential during excavation phase. Exposure potential for Alternatives 3a, 3b, and 7 however, is slightly greater given additional earth work and handling of contaminants associated with on-Site containment. Therefore, Alternatives 4 and 5 better satisfy this criteria.

6. **Implementability:** Implementation of the amended O.U. #3 remedy is expected to be easier than the original LTTD remedy. Issues associated with substantive regulatory requirements for any on-Site thermal treatment unit are eliminated while issues associated with construction sequencing and material handling (as with on-Site containment structures) will be simplified. Implementation of the amended O.U. #3 remedy will require some degree of institutional control. Specifically, U.S. EPA must insure that future land use is limited to industrial application, in keeping with the State of Michigan Part 201 Industrial cleanup standards.

Operation and maintenance (O&M) associated with the amended O.U. #3 remedy would be minimal due to the continuing requirement for on-Site personnel operating the O.U. #1 and #2 remedy. In addition, because this Remedial Action will be limited to immediate removal of the most highly contaminated soils, O&M of the amended remedy will consist of Site inspection, nominal maintenance of excavated areas, continuation of institutional controls, and sediment and surface water monitoring. Standard construction methods for all Alternatives are well established making all Alternatives implementable.

7. **Cost**; In the 1993 ROD, Alternative 4 was shown as potentially having the lowest present worth cost of available remedy options. Alternative 6 (LTTD), however, was selected due to the preference for treatment and State and community acceptance. The relative comparison of alternatives demonstrated that on-Site containment options (3a, 3b, 7) had costs comparable to Alternative 4. Alternatives containing treatment components (5, 6) showed greater cost, with off-Site incineration of soils being the highest.

The 1993 ROD noted that the community had responded negatively to the creation of on-Site containment structures. Therefore, for the purposes of this ROD Amendment, updated costs were obtained for excavation of the soils and several off-Site disposal options (landfilling and incineration). Cost allowances for the soil components of each disposal option are presented in Table 7 with O&M and Present Worth estimates shown as Table 8 and 9.

Off-Site landfilling (Alternative 4) appears to be the most cost effective. Costs presented are allowances representing maximum potential excavation volumes. It is anticipated that 4,000 cubic yards is the more likely soil volume to be excavated and disposed of rather than the 10,000 used for cost estimating purposes. In the event off-Site incineration is required for some excavated material, the cost allowance shown for the landfilling option should provide adequate contingency. There may be some variability in cost depending on:

a. the depth at which contamination is no longer found;
b. the depth at which groundwater is present, (a physical limitation to excavation);
c. whether excavated soils are RCRA characteristic, associated hazardous or non-hazardous disposal including exceedance of RCRA LDR treatment standards, and the resulting off-Site disposal requirements;
d. the presence and concentration of Dioxi , which may require incineration in an incinerator permitted for Dioxin wastes;
e. the degree of extraneous waste material found (such as drums or lab packs);
f. the amount of fill actually used.

As with any Remedial Action, it may become necessary or possible to excavate more or less material, or it may be possible to dispose of excavated soils as non-hazardous wastes. Capital cost allowances shown for this Remedial Action may therefore vary. U.S. EPA will monitor contaminant concentration closely during excavation to

insure that unnecessary excavation or disposal does not occur. Funds already obligated for the LTTD remedy will be utilized for this Remedial Action and should be adequate for completion of this amended O.U. #3 remedy. As previously mentioned, it is most likely that 4,000 yd^3 of excavated soils will be disposed of at a RCRA Subtitle D landfill.

MODIFYING CRITERIA

8. **State Acceptance:** The State of Michigan concurs on the selected remedy for this Amendment to the Record of Decision. MDEQ has recommended that this soil removal occurs to remove risk threats associated with direct contact and biotoxicity and to assist in alleviation of the contaminant burden on groundwater.

9. **Community Acceptance;** Community acceptance of the amended remedy has been evaluated after the close of the public comment period and is described in the attached Responsiveness Summary. There was a moderate response to the Proposed Plan for the amended remedy. Of the few comments received, however, some members of the community appear to moderately disfavor the reduction in scope of the O.U. #3 Remedial Action. This comes from the impermanence associated with landfill disposal and the appearance that cleanup standards and the remedy's scope have changed without consideration of adverse health effects.

V. STATUTORY DETERMINATIONS

The amended remedy complies with requirements of CERCLA § 121 by controlling Site risks posed by ground water, air, or direct contact with hazardous materials through the removal and disposal of Site soils. This action will not cause unacceptable short-term risk or cross-media impacts. The amended remedy complies with all State and Federal ARARs. There are no chemical, action or location-specific ARARs identified for this action that were not identified and discussed in the original ROD The amended remedy is cost-effective and reduces costs associated with construction sequencing, material handling, temporary storage of contaminated soils, and possible recontamination of treated soil used as fill. In addition, continuing capital and operational costs of on-Site thermal treatment equipment will be eliminated. For future industrial use, this amended O.U. #3 remedy provides an acceptable reduction of Site risks.

The amended remedy provides the best balance of trade-offs with respect to the evaluation criteria. Treatment of O.U. #3 wastes presenting the primary risk at the Site was found not to be cost effective because of the small soil volume. Other considerations include the re-evaluation of future land use for the Site as

industrial instead of residential, the revised State of Michigan statutes allowing this re-evaluation, the associated cleanup standards, and the high potential for re-contamination of treated soils.

This ROD Amendment is not inconsistent with past or future Remedial Actions. U.S. EPA intends to scrutinize the operations of the groundwater extraction and treatment systems currently operating and determine their effectiveness in preventing adverse effects to Little Bear Creek and its unnamed tributary. To that end, surface water and sediment monitoring will be compared against data being collected during GWTP operations. At some point in the future, U.S. EPA may perform modeling to better determine the effectiveness, nature and extent of past and future Remedial Action.

Goals of this amended O.U. #3 remedy are to excavate soil in Site areas identified as presenting:

(1) the greatest risk to human health from direct contact exposure,
(2) the greatest potential for continual leaching of contaminants into groundwater, or
(3) the greatest threat to vegetative and other life forms as demonstrated by biological testing.

The remote location and current zoning of the Site as industrial supports the assertion that the anticipated future land use for the Site is industrial in nature. Part 201 recognizes that an inactive or abandoned site whose primary activity was industrial in nature (as is the case with this Site) should continue to be classified as industrial. U.S. EPA foresees that appropriate institutional controls (such as deed restrictions) combined with standard security measures will be adequate to prevent or limit the exposure potential for nearby residents and will guarantee that the Site is not used for anything except industrial activity.

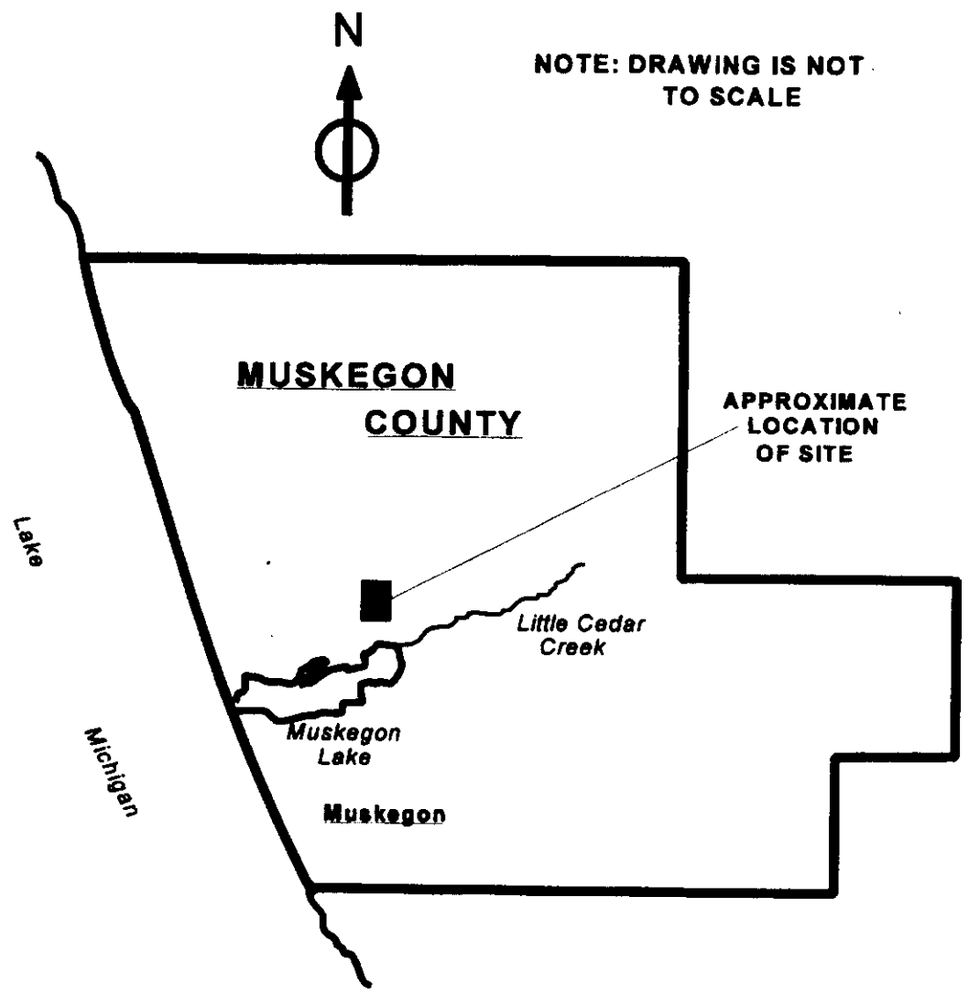

FIGURE 1 - COUNTY LOCATION OF OTT/STORY/CORDOVA SITE

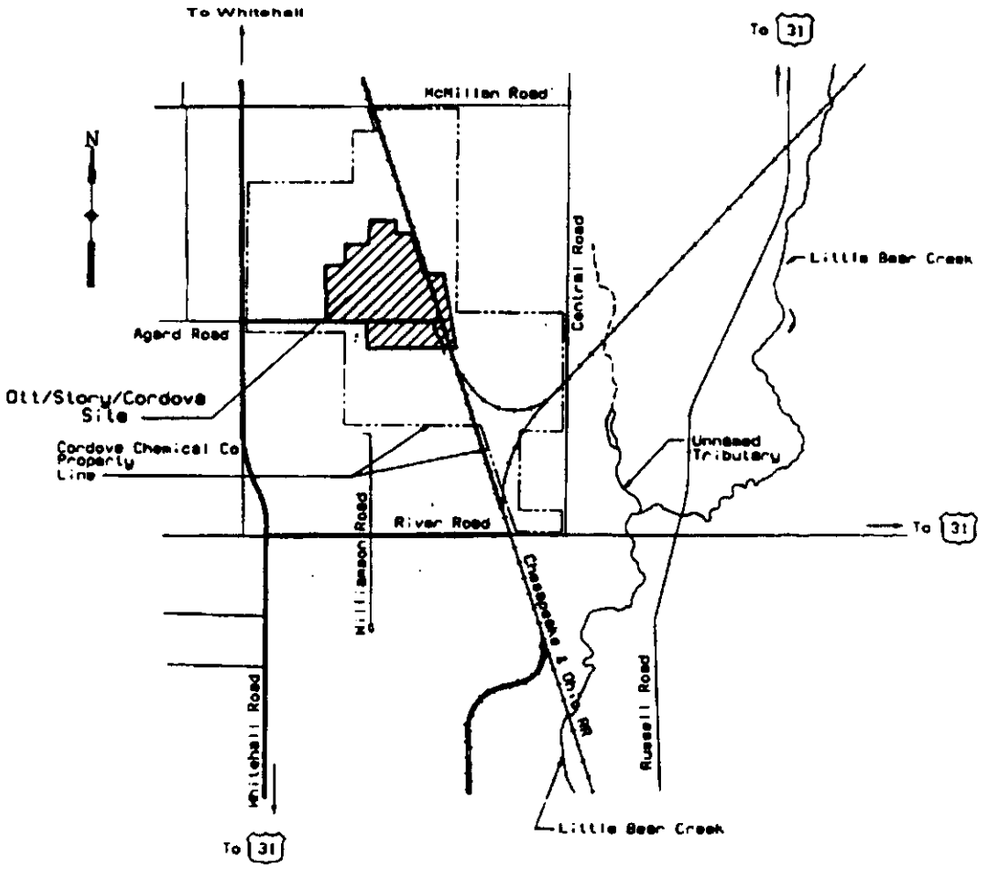

FIGURE 2 - LOCAL SITE LOCATION

NOT TO SCALE

NOTES:

1. DRAWING NOT TO SCALE
2. ALL EXCAVATION AREAS APPROXIMATE

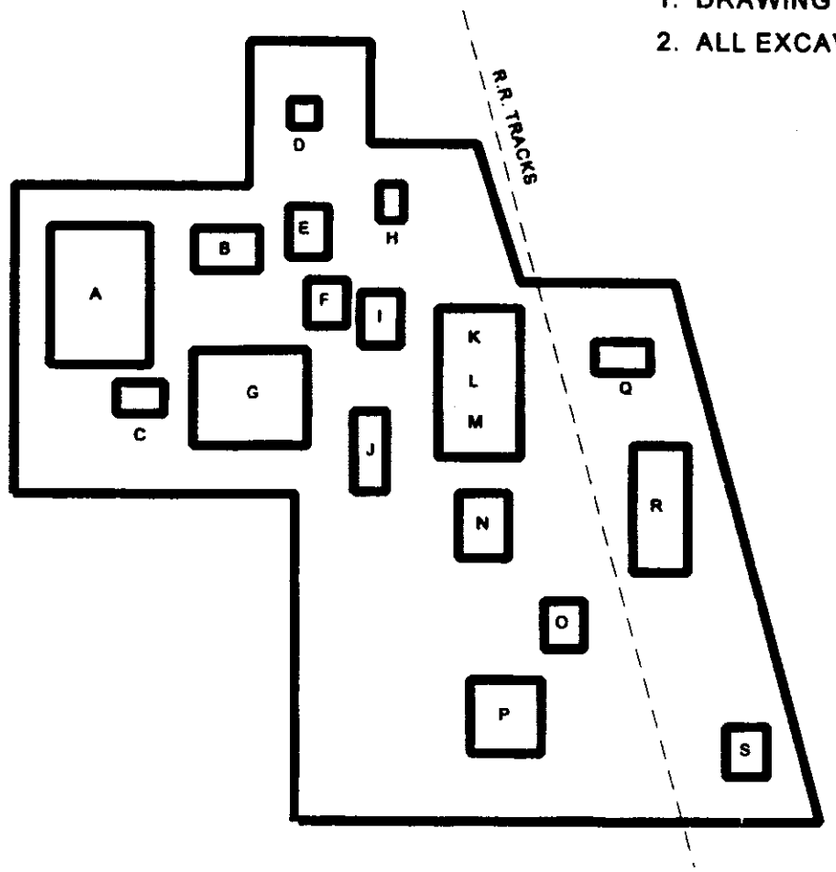

FIGURE 3 - PROPOSED LTTD REMEDY EXCAVATION AREAS

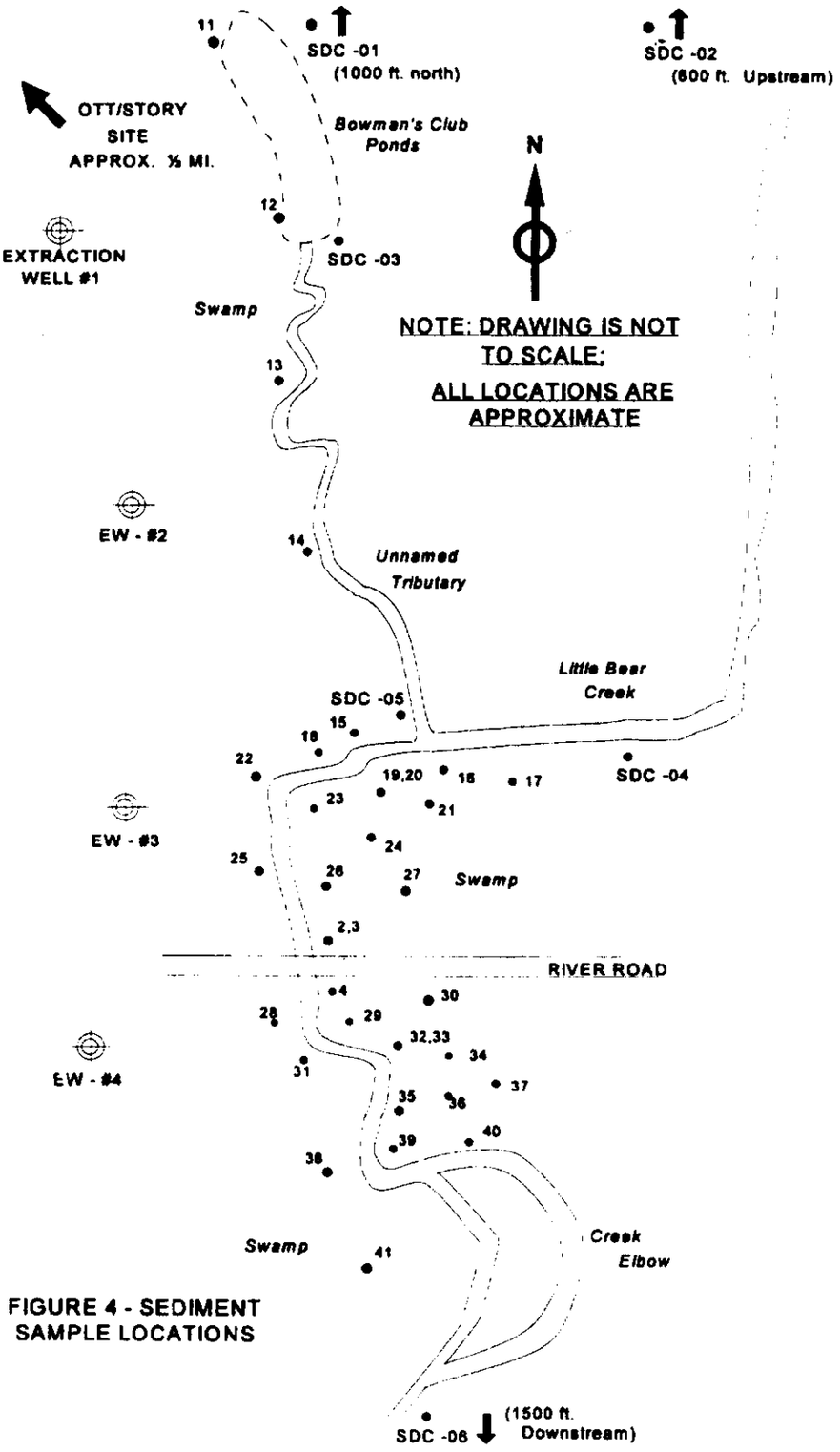

FIGURE 4 - SEDIMENT
SAMPLE LOCATIONS

NOTES:

1. DRAWING NOT TO SCALE
2. ALL EXCAVATION AREAS APPROXIMATE

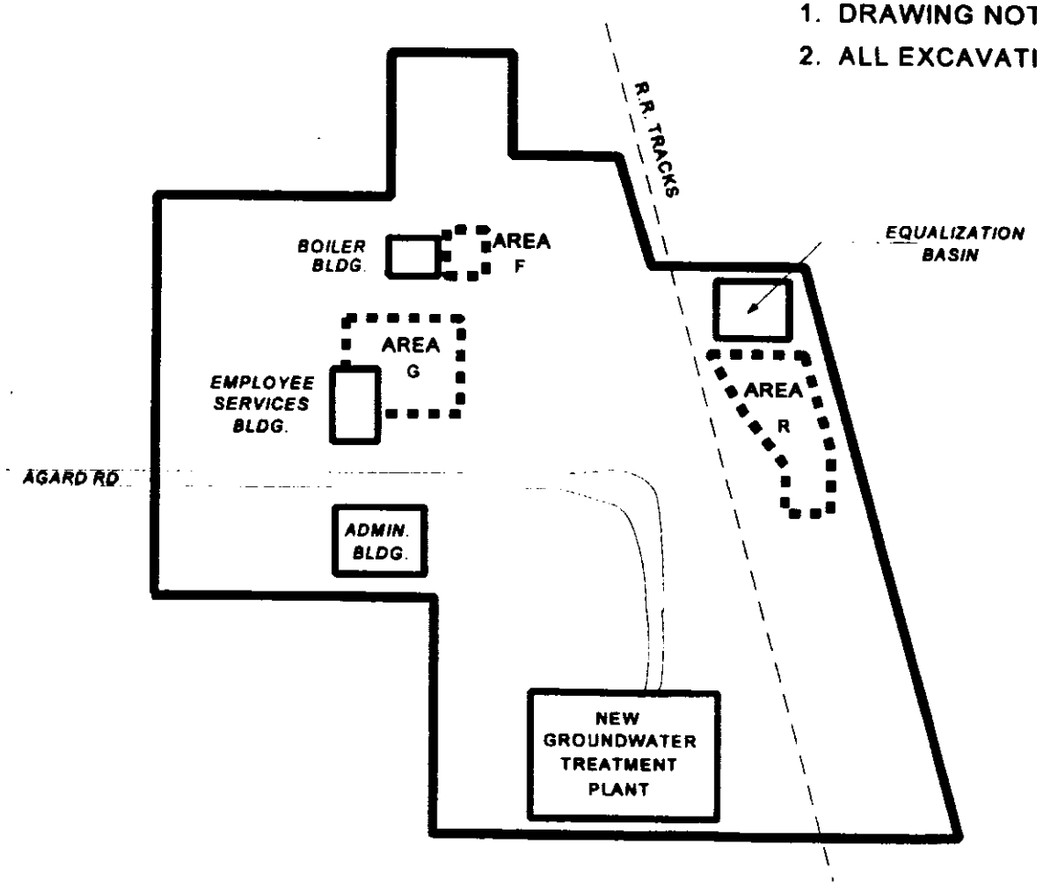

FIGURE 5 - PROPOSED SOIL EXCAVATION AREAS FOR OFF-SITE DISPOSAL

TABLE 1 - CONTAMINANT CONCENTRATIONS - O.U. #3 (PLANT AREA) SOILS [1]

ALL VALUES SHOWN ARE IN µg/kg (parts per billion, ppb) UNLESS OTHERWISE NOTED.

CONTAMINANT	Industrial 20 X DW[2] Standard	Target MDL[3]	Michigan Part 201 Industrial Soils DCV[4] Standard	O.U. #3 Excavation Area									
				A	B	C	D	E	F	G	H	I	J
Acetone	42000	100	74,000,000									24	
Carbon Tetrachloride	100	10	190,000										
Chlorobenzene *	2000	10	14,000,000		16 J		5 J						
Chloroform	2000	10	4,100,000										
1,2-Dichloroethane *	100	10	270,000						6				
cis-1,2-Dichloroethene	1400	10	8,200,000										
trans-1,2-Dichloroethene	2000	10	13,000,000					3 J					
Ethylbenzene *	14000	10	72,000,000				5 J		1.2 J				
2-Hexanone	58000	100	100,000,000				3 J						
Methylene Chloride *	100	10	3,300,000	3.66 JB	110 B				3.11 JB			4.02 J B	
4-Methyl-2-Pentanone	20000	100	37,000,000	3 J	5 J		7 J	150		6 J	3 J	2 J	
Styrene	2000	10	830,000				9						
Tetrachloroethene *	100	10	490,000		1.21 J		3 J	21	22		1 J	46 J	7
1,1,2,2-Tetrachloroethane*	340	10	120,000				18						
Toluene *	20000	10	160,000,000	1 J	620	23		6	1600 J	25	5 J	220	19
1,2,3-Trichlorobenzene	ID[5]	10	ID[5]										
1,1,1-Trichloroethane *	4000	10	21,000,000						17000				
1,1,2-Trichloroethane *	100	10	440,000						3.98 J				
Trichloroethene *	100	10	1,600,000		1.09 J		4 J	6					
Xylenes (total) *	200000	30	1,000,000,000		3.84 J		8		79000				
Benzo(a)Anthracene [7]	96[8]	330	210,000										

TABLE 1 - CONTAMINANT CONCENTRATIONS - O.U. #3 (PLANT AREA) SOILS [1]

ALL VALUES SHOWN ARE IN µg/kg (parts per billion, ppb) UNLESS OTHERWISE NOTED.

CONTAMINANT	Industrial 20 X DW[2] Standard	Target MDL[3]	Michigan Part 201 Industrial Soils DCV[4] Standard	O.U. #3 Excavation Area									
				A	B	C	D	E	F	G	H	I	J
Benzo(b)Fluoranthene [7]	96 [8]	330	210,000		400				90 J				290 J
Benzo(k)Fluoranthene [7]	960 [8]	330	2,100,000						60 J				
Benzo(a)Pyrene [7]	4 [8]	330	21,000										
Benzoic Acid	1840000	330	1,000,000,000									2100	
bis (2-Ethylhexyl) phthalate [7]*	120 [8]	330	11,000,000	2100	150 J			73 J	150 J	1900	69 J		
Butylbenzylphthalate *	66000	330	720,000,000						68 J			220 J	
4-Chloroaniline	N/A [6] (1660)	1300	N/A [6] (18,000,000)							2700			1200
Chrysene [7]	9600 [8]	330	21,000,000										160 J
1,2-Dichlorobenzene *	12000	10	64,000,000							43 J	320 J	46 J	
1,4-Dichlorobenzene *	1500	10	1,000,000							330	130 J		
Di-n-Butylphthalate	50000	330	540,000,000		1600								
Di-n-Octylphthalate	7600	330	81,000,000						130 J			350 J	
Fluoranthene	50000	330	540,000,000		730							180 J	
Hexachlorobenzene *	20	20	94,000		53.3					710			
2-Methylnapthalene	15,000	330	160,000,000						82 J				740
Napthalene	15000	330	160,000,000										390
4-Nitroaniline	N/A [6] (1260)	1700	N/A [6] (13,000,000)		2700				630 J			750 J	
N-nitrosodiphenylamine	14000	330	5,100,000										
Phenanthrene	1500	330	16,000,000									100 J	290 J

TABLE 1 - CONTAMINANT CONCENTRATIONS - O.U. #3 (PLANT AREA) SOILS [1]
ALL VALUES SHOWN ARE IN µg/kg (parts per billion, ppb) UNLESS OTHERWISE NOTED.

CONTAMINANT	Industrial 20 X DW[2] Standard	Target MDL[3]	Michigan Part 201 Industrial Soils DCV[4] Standard	O.U. #3 Excavation Area									
				A	B	C	D	E	F	G	H	I	J
Phenol	260000	330	450,000,000	53 J									
Pyrene	32000	330	340,000,000		480				140 J	51 J		110 J	
1,2,4-Trichlorobenzene *	1400	330	68,000,000						230 J				
Aldrin *	4 [8]	20	8,800						72	52		290 J	
α-BHC	11	20	24,000										
β-BHC	38	20	83,000										
4,4'-DDT *	200	20	440,000			120 J			2700	5900		25000	270 J
Dieldrin *	4.4 [8]	20	9,400							140			
Endosulfan I	96 [8]	20	1,000,000							190			
Endosulfan sulfate *	ID [5]	20	ID [5]										
Endrin [7]	40 [8]	20	770,000							97			
Heptachlor [7]	8 [8]	20	33,000										
Heptachlor epoxide [7]	4 [8]	20	16,000										
Methoxychlor *	800	50	23,000,000		610 J				8400	5300			
Arochlor 1248 (PCBs) [7]*	10 [8]	330	21,000							5800		1250	
TCDD Toxicity Equivalent (Dioxin) [9]	0.0006 [8] Note 9	0.001	0.99						0.77	0.728			

TABLE 1 - CONTAMINANT CONCENTRATIONS - O.U. #3 (PLANT AREA) SOILS [1]

ALL VALUES SHOWN ARE IN µg/kg (parts per billion, ppb) UNLESS OTHERWISE NOTED.

CONTAMINANT	Industrial 20 X DW[2] Standard	Target MDL[3]	Michigan Part 201 Industrial Soils DCV[4] Standard	O.U. #3 Excavation Area								
				K	L	M	N	O	P	Q	R	S
Acetone	42000	10	7.40e+07								7 J	
Carbon Tetrachloride	100	10	1.90e+05								26000	
Chlorobenzene *	2000	10	1.40e+07									
Chloroform	2000	10	4.10e+06								0.9 J	
1,2-Dichloroethane *	100	10	2.70e+05			3						
cis-1,2-Dichloroethene	1400	10	8.20e+05									
trans-1,2-Dichloroethene	2000	10	1.30e+06									
Ethylbenzene *	14000	10	7.20e+06									
2-Hexanone	58000	10	1.00e+07									
Methylene Chloride *	100	100	3.30e+05					2.78 J B		5.54 B		
4-Methyl-2-Pentanone	20000	10	3.70e+06						2 J			
Styrene	2000	10	8.30e+05									
Tetrachloroethene *	100	10	4.90e+05			18		1.13 J		160	2300	
1,1,2,2-Tetrachloroethane*	340	10	1.20e+05									
Toluene *	20000	10	1.60e+08	18		15	13				880	
1,2,3-Trichlorobenzene	ID [5]	10	ID [5]							18		
1,1,1-Trichloroethane *	4000	330	21,000,000									4 J
1,1,2-Trichloroethane *	100	10	440,000			37				38	3100	
Trichloroethene *	100	10	1,600,000									
Xylenes (total) *	200000	10	1,000,000,000									
Benzo(a)Anthracene [7]	96 [8]	30	210,000				47 J					

TABLE 1 - CONTAMINANT CONCENTRATIONS - O.U. #3 (PLANT AREA) SOILS [1]

ALL VALUES SHOWN ARE IN µg/kg (parts per billion, ppb) UNLESS OTHERWISE NOTED.

CONTAMINANT	Industrial 20 X DW[2] Standard	Target MDL[3]	Michigan Part 201 Industrial Soils DCV[4] Standard	O.U. #3 Excavation Area								
				K	L	M	N	O	P	Q	R	S
Benzo(b)Fluoranthene [7]	96 [8]	330	210,000			1300 D J						
Benzo(k)Fluoranthene [7]	960 [8]	330	210,000			1500 D J						
Benzo(a)Pyrene [7]	4 [8]	10	21,000	330 J								
Benzoic Acid	1,800,000	330	1,000,000,000							75000 J	2900 J	
bis (2-Ethylhexyl) phthalate [7]*	120 [8]	3300	11,000,000	340 J	530	230 J	91 J		150 J		560 J	
Butylbenzylphthalate *	66000	330	720,000,000								210 J	
4-Chloroaniline	N/A [6] (1660)	330	N/A [6] (18,000,000)	1700	410	310	150 J				1200	
Chrysene [7]	9600 [8]	1300	21,000,000	190 J		1800 D J	150 J					
1,2-Dichlorobenzene *	12000	330	64,000,000							11000 J	13000 J	
1,4-Dichlorobenzene *	1500	10	1,000,000								7600 J	
Di-n-Butylphthalate	50000	10	540,000,000					70.4 J		121 J	137 J	
Di-n-Octylphthalate	7600	330	81,000,000									
Fluoranthene	50000	330	540,000,000	470		190 J	62 J				200 J	
Hexachlorobenzene *	20	330	94,000	3400							7800 J	
2-Methylnapthalene	ID [5]	20	ID [5]			1000	170 J				780 J	
Napthalene	15000	330	160,000,000									
4-Nitroaniline	N/A [6] (1260)	330	N/A [6] (13,000,000)									
N-nitrosodiphenylamine	14000	1700	5,100,000	310								
Phenanthrene	1500	330	16,000,000			2600 J	38 J				340 J	

TABLE 1 - CONTAMINANT CONCENTRATIONS - O.U. #3 (PLANT AREA) SOILS [1]

ALL VALUES SHOWN ARE IN µg/kg (parts per billion, ppb) UNLESS OTHERWISE NOTED.

CONTAMINANT	Industrial 20 X DW[2] Standard	Target MDL[3]	Michigan Part 201 Industrial Soils DCV[4] Standard	O.U. #3 Excavation Area								
				K	L	M	N	O	P	Q	R	S
Phenol	260000	330	450,000,000								690 J	
Pyrene	32000	330	340,000,000	450		1800 D J	72 J					
1,2,4-Trichlorobenzene *	1400	330	68,000,000	300 J							480 J	
Aldrin *	4 [8]	20	8,800	43		69				30	29.5	
α-BHC	11	20	24,000			22						
β-BHC	38	20	83,000			47						
4,4'-DDT *	200	20	440,000				37 J				1200 J	
Dieldrin *	4.4 [8]	20	9,400			190						
Endosulfan I	96 [8]	20	1,000,000									
Endosulfan sulfate *	ID [5]	20	ID [5]							870		
Endrin [7]	40 [8]	20	770,000									
Heptachlor [7]	8 [8]	20	33,000			18						
Heptachlor epoxide [7]	4 [8]	20	16,000									
Methoxychlor *	800	50	23,000,000	1300		930				25000		
Arochlor 1248 (PCBs) [7]*	10 [8]	330	21,000			15000		3900			950	
TCDD Toxicity Equivalent (Dioxin) [9]	0.0006 [8] Note 9	0.001	0.99			0.2		ND	0.128			

FOOTNOTES FOR TABLE 1

* An asterisk denotes that contaminant was identified in 1993 Record of Decision as a contaminant of concern.

1 Values shown are peak concentrations detected during all Site studies, including the Remedial Investigation, Remedial Design, as well as pre- and post-ROD independent studies. See Figure 3 for layout of OU #3 areas.

2 20 x DW - 20 times the Part 201 Industrial drinking water standard. This is the contaminant concentration in soils which, if exceeded, may cause leaching of contaminants into groundwater at levels exceeding acceptable drinking water standards.

3 MDL - Method Detection Limit. The Target Method Detection Limit is the lowest value accepted by the State of Michigan that laboratory equipment can measure. If the 20 x DW value is lower than what the laboratory can detect, then the TMDL becomes the cleanup standard.

4 DCV - Part 201 Industrial Direct Contact Value. This is the contaminant concentration in soils which, if exceeded, presents an unacceptable risk to human health and the environment within a typical industrial scenario. Any exposure to plant area soils would be to an individual working on the Sitewithin a controlled work environment.

5 ID - Inadequate Data. The State of Michigan does (did) not have enough health risk data to develop criterion for this contaminant. U.S. EPA's support contractor, however, may calculate estimates for these compounds using accepted MDEQ methods. These estimates may be used to define the extent of excavation during implementation of the amended O.U. #3 remedy.

6 N/A - Not available. U.S. EPA's support contractor, however, has calculated estimates for these compounds using accepted MDEQ methods (shown in parenthesis). These estimates may be used to define the extent of excavation during implementation of the amended O.U. #3 remedy.

7 Due to its physicochemical properties, contaminant is not expected to leach into groundwater.

8 20 times Michigan Act 399 (Safe Drinking Water Act) drinking water standard.

9 The 20 times Michigan Act 399 (Safe Drinking Water Act) drinking water standard for this contaminant is not applicable here because, for soils, this contaminant was shown in Site specific sampling not to leach at unacceptable levels. The DCV is the applicable standard for soils removal.

DATA QUALIFIER LEGEND

When chemical analysis data is submitted to U.S. EPA, Limitations of analytical equipment must be noted with results so an accurate scrutiny can be performed. These Limitations are shown as qualifiers, noted as letters next to numerical values. Explanations of these qualifiers are as follows:

J - Signifies a value that was estimated. This means that the compound was detected by the analytical equipment but the value shown may not be able to be reproduced exactly if the analysis were repeated.

B - Signifies a compound that was also detected in a blank. A blank is a 'clean' sample prepared in the laboratory, carried with field samples, transported, and stored. If contamination is found in a blank, there is a possibility that contamination may be from a source other than what was sampled (such as through faulty sampling, storage, transportation, or laboratory procedures).

D - Signifies that the sample shown had to be diluted for the lab equipment to show results that are reproducible.

TABLE 2 - CONTAMINANT CONCENTRATIONS - SEDIMENTS IN LITTLE BEAR CREEK AND UNNAMED TRIBUTARY [1]

ALL VALUES SHOWN ARE IN ug/kg (parts per billion, ppb) UNLESS OTHERWISE NOTED.

CONTAMINANT	Michigan Part 201 Residential Soils DCV Level [3]	TMDL [4]	SEDIMENT SAMPLE POINTS [2]														
			2-3	4	11	12	13	14	15 - 17	18 -21	22-24	25-27	28-30	31-34	35-37	38-40	41
Acetone	11,000,000	100			44.8 B		4.6 J B	31 J B	411	806	129	283	264	7420	678		40.1
Benzene	88,000	10	17000	17000	143			156	128	47500	344	3250	108	1240		175	3.75 J
2-Butanone	2.0 e +08 [5]	100			16 J				25.1 J			18.1 J		587	236	47	29.3 J
Carbon Disulfide	12,000,000	100						6.32 J		35.4 J	6.62 J	44.8 J		46.2 J		9.88 J	
Chlorobenzene	2,100,000	10	1400	2400				319		3090	2.74 J	106 J	3.96 J	49.5 J		2.07 J	
Chloroethane	670,000	10	1100	1700	42.7					1390	89.9	108 J	4.25 J	542	52.6	123	
Chloroform	4.23+05	10									6.18 J	18.2					
Chloromethane	200,000	10												61.3 J			
1,1-Dichloroethane	13,000,000	10								67 J							
1,2-Dichloroethane	28,000	10										7.25 J					
Ethylbenzene	11,000,000	10			24.3			34.8		854		3.1 J					
2-Hexanone	15,000,000	100								31.1 J							
Methylene Chloride	340,000	10			31.2 B	11.6 B	16.6 B	24.8 B	31.1 B	346 B	114 B	121 J B	26.2 B	215 B	31.3 J B	50 B	24.7 B
4-Methyl-2-Pentanone	5,500,000	100								30.7 J	2.81 J			173 J		3.68 J	
1,1,2,2-Tetrachloroethane	13,000	10				7.14 J											
Tetrachloroethene	50,000	10			6.44 J				42.1 B	62.2 J	19.8 B	591 B		35.7 J B	22 B	27.2 B	9.16 J B
Toluene	24,000,000	10	42000	99000	150			14.6 J	43.8	38600	446	53100		1060	70.6	18.1	3.63 J
Trichloroethene	160,000	10				4.59 J					2.56 J	57			6.37 J	2.71 J	
Vinyl Acetate	9,700,000	100												20 J			
Xylenes (total)	200,000,000	30	1000					36		5040	5.24 J	97 J					

TABLE 2 - CONTAMINANT CONCENTRATIONS - SEDIMENTS IN LITTLE BEAR CREEK AND UNNAMED TRIBUTARY [1]

ALL VALUES SHOWN ARE IN µg/kg (parts per billion, ppb) UNLESS OTHERWISE NOTED.

CONTAMINANT	Michigan Part 201 Residential Soils DCV Level [3]	TMDL [4]	SEDIMENT SAMPLE POINTS [2]														
			2-3	4	11	12	13	14	15 - 17	18 -21	22-24	25-27	28-30	31-34	35-37	38-40	41
Benzoic Acid	1,000,000,000	3300							237 J	156 J		1440 J	3640 J		823 J	360 J	154 J
Benzo(a)Pyrene [7]	1,400	330							286 J								
bis (2-Ethylhexyl)phthalate [7]	700,000	330	120									575 J					
Butylbenzylphthalate	68,000,000	330							288 J	2320 J	536 J	19200	52.6 J	2290		165 J	267 J
4-Chloroaniline	N/A [6] (1,700,000)	1300	1600	780									74.4 J	1040 J			
Di-n-Butylphthalate	51,000,000	330			389 J	129 J	109 J		295 B	128 J B	132 J B	241 J B	344 J B		173 J		
Dibenzofuran	ID [5]	330											394 J				
1,2-Dichlorobenzene	9,400,000	10						2380		969 J							
1,4-Dichlorobenzene	110,000	10						454 J									
Diethylphthalate	320,000,000	330															
Fluoranthene	51,000,000	330											88.9 J				
2-Methylphenol	5,500,000	330	320									550 J					
4-Methylphenol	2,100,000	330	1000	250													
N-nitrosodiphenylamine	520,000	330	230														
Phenol	66,000,000	330	410	210													
Pyrene	32,000,000	330	69										81.1 J				
4,4'-DDT [7]	29,000	20									8.42 J				40.8		
Dieldrin [8]	620	20							6.74	2.34 J				3.13 J	10.5		10.3
Endosulfan II [8]	97,000	3.3												1.85 J			

FOOTNOTES FOR TABLE 2

1 Values shown are peak concentrations detected during all Site studies, including the Remedial Investigation, Remedial Design, as well as pre- and post-ROD independent studies. See Figure 4 for sample locations.

2 Sample point labels shown correspond to locations shown in Figure 4.

3 DCV - Part 201 Residential Direct Contact Value. This is the contaminant concentration in soils which, if exceeded, presents an unacceptable risk to human health and the environment based on exposure t hose soils within a typical residential scenario. These standards are shown here for comparison purposes only. Any exposure to Little Bear Creek would be to a resident using the Creek for recreational purposes, and, as such, uncontrolled (as opposed to an industrial scenario).

4 TMDL - Target Method Detection Limit. This is the lowest value accepted by the State of Michigan that laboratory equipment can detect. If the DCV value is lower than what the laboratory can detect. 'ıen the cleanup standard becomes the TMDL.

5 Standard scientific notation. For example, a value shown as 2.0e+08 is 2.0×10^{8}, or, in standard numeric format, a value of 200,000,000.

6 N/A - Not available. U.S. EPA's support contractor, however, has calculated estimates for these compounds using accepted MDEQ methods (shown in parenthesis). These estimates may be used to define the extent of excavation during implementation of the amended O.U. #3 remedy.

7 Due to its physicochemical properties, contaminant is not expected to leach into groundwater.

8 ID - Inadequate Data. The State of Michigan does (did) not have enough health risk data to develop criterion for this contaminant. U.S. EPA's support contractor, however, may calculate estimates for these compounds using accepted MDEQ methods. These estimates may be used to define the extent of excavation during implementation of the amended O.U. #3 remedy.

9 20 times Michigan Act 399 (Safe Drinking Water Act) drinking water standard.

DATA QUALIFIER LEGEND

When chemical analysis data is submitted to U.S. EPA, limitations of analytical equipment must be noted with results so an accurate scrutiny can be performed. These limitations are shown as qualifiers, noted as letters next to numerical values. Explanations of these qualifiers are as follows.

J - Signifies a value that was estimated. This means that the compound was detected by the analytical equipment but the value shown may not be able to be reproduced exactly if the analysis were re ated.

B - Signifies a compound that was also detected in a blank. A blank is a 'clean' sample prepared in the laboratory, carried with field samples, transported, and stored. If contamination is found in a blank, there is a possibility that contamination may be from a source other than what was sampled (such as through faulty sampling, storage, transportation, or laboratory procedures).

D - Signifies that the sample shown had to be diluted for the lab equipment to show results that are reproducible.

TABLE 3 - EXCEEDANCE OF SOIL CLEANUP STANDARDS FOR OTT/STORY/CORDOVA O.U. #3 PLANT AREA SOILS [1]
ALL VALUES ARE IN µg/kg (parts per billion, ppb) UNLESS OTHERWISE NOTED

CONTAMINANT	O.U. #3 AREA	20 X DW, DCV, or TMDL VALUE EXCEEDED[2]	CONTAMINANT CONC.	COMMENTS
Carbon Tetrachloride	Area R	100 (20 xDW)	26000	Exceedance based on 1992 data, but contaminant not present at unacceptable levels based on 1995 sampling. It is not expected, however, that this compound would be reduced from 26,000 ppb to undetectable levels between 1992 and 1995. This exceedance is a contributing factor [3] as to why this Area should be excavated.
Methylene Chloride	Area B	100 (20 x DW)	110 B	Exceedance based on 1988 data, but contaminant not present at unacceptable levels based on later sampling. Compound was also detected in a 'blank' (see Data Qualifier Legend below).
Tetrachloroethene	Area Q	100 (20 X DW)	160	Exceedance based on 1988 data, but contaminant not present at unacceptable levels based on later sampling.
	Area R	100 (20 X DW) 5 (RES) [4]	2300 (year 1988) 100 (year 1995, with leachate >5 ppb*)	Exceedance based on 1992 data. In 1995, compound was shown to be present in soil at 100 ppb (equal to 20 x DW soil std.) and shown to leach from soil at concentrations greater than 5 ppb* (industrial groundwater standard). There are other contributing factors [3] as to why Area R should be excavated.
1,1,1 - Trichloroethane	Area F	4000 (20 x DW)	17000	Exceedance based on 1988 data, but contaminant not present at unacceptable levels based on later sampling. The history of activity in this Area is a contributing factor [3] as to why Area F should be excavated.
Benzo(b)Fluoranthene	Area B, M	330 (TMDL; 20 x DW= 96 ppb)	400, 1300 D J	400 ppb exceedance discovered in 1995, but shown not to leach out of soil at unacceptable levels. Area B was previously remediated and filled with clean soil. 1300 ppb exceedance discovered in 1988, not present at unacceptable levels based on later sampling.
Benzo(k)Fluoranthene	Area M	960 (20 x DW)	1500 D J	Exceedance based on 1988 data, but contaminant not present at unacceptable levels based on later sampling.

TABLE 3 - EXCEEDANCE OF SOIL CLEANUP STANDARDS FOR OTT/STORY/CORDOVA O.U. #3 PLANT AREA SOILS [1]
ALL VALUES ARE IN µg/kg (parts per billion, ppb) UNLESS OTHERWISE NOTED

CONTAMINANT	O.U. #3 AREA	20 X DW, DCV, or TMDL VALUE EXCEEDED[2]	CONTAMINANT CONC.	COMMENTS
bis (2-ethylhexyl) phthalate	Area A,K,L	330 (TMDL [3]; 20 x DW = 120 ppb)	2100, 890, 530	Area A Exceedance based on 1988 data, but contaminant not present at unacceptable levels based on later sampling. Area K exceedance was discovered in 1995, but shown not to leach out of soil at unacceptable levels. Area L exceedance based on 1988 data, but contaminant not present at unacceptable levels based on later sampling.
	Area G,R	330 (TMDL)	1900, 560 J	Area G exceedance discovered in 1995, but shown not to leach out of soil at unacceptable levels. Area R exceedance discovered in 1988, but contaminant not present at unacceptable levels based on later sampling. There are other contributing factors [3] as to why Areas G and R should be excavated.
4-Chloroaniline	Area K	N/A; 1660 ppb (est 20 x DW level) [5]	1700	Exceedance based on 1992 data. This compound was found not to leach from soil at unacceptable levels during 1995 testing.
	Area G	N/A; 1660 ppb[5]	2700	Exceedance based on 1992 data, but contaminant not present at unacceptable levels based on later sampling.
1,2-Dichlorobenzene	Area R	12000 (20 x DW)	13000 J	Exceedance based on 1988 data, but contaminant not present at unacceptable levels based on later sampling. There are other contributing factors [3] as to why Area R should be excavated.
1,4-Dichlorobenzene	Area R	1500 (20 x DW)	7600 J	Exceedance based on 1988 data, but contaminant not present at unacceptable levels based on later sampling. There are other contributing factors [3] as to why Area R should be excavated.

TABLE 3 - EXCEEDANCE OF SOIL CLEANUP STANDARDS FOR OTT/STORY/CORDOVA O.U. #3 PLANT AREA SOILS [1]

CONTAMINANT	O.U. #3 AREA	20 X DW, DCV, or TMDL VALUE EXCEEDED[2] (ppb)	CONTAMINANT CONC. (ppb)	COMMENTS
Hexachlorobenzene	Area B	20 (20 x DW)	53.3	Exceedance based on 1994 data, but shown not to leach out of soil at unacceptable levels during 1995 sampling.
	Area K	20 (20 x DW)	3400	Exceedance based on 1988 data, but shown in 1995 not to leach out of soil at unacceptable levels.
	Area G	20 (20 x DW)	710	Exceedance based on 1992 data, but contaminant shown not to leach out of soil at unacceptable levels during 1995 sampling. There are other contributing factors [3] as to why Area G should be excavated.
	Area R	20 (20 x DW)	980, 7800 J	Exceedance based on 1988 data, but contaminant shown not to leach out of soil at unacceptable levels during 1995 sampling. There are other contributing factors [3] as to why Area R should be excavated.
4-Nitroaniline	Area B	1260 (20 x DW)	2700	Exceedance based on 1988 data, but contaminant not present at unacceptable levels based on later sampling.
Phenanthrene	Area M	1500 (20 x DW)	2600 J	Exceedance based on 1988 (and 1995) data, but shown not to leach out of soil at unacceptable levels during 1995 sampling.
Aldrin	Area F,G,R	20 (TMDL)	72, 52,29.5	Area F nd G exceedance based on 1995 data, but contaminant shown not to leach out of soil at unacceptable levels. Area R exceedance based on 1994 data, but contaminant not present at unacceptable levels based on later sampling. There are other contributing factors [3] as to why Areas F and R should be excavated.
	Area I, K, M, Q	20 (TMDL)	290 J, 43, 69, 30	Area I and K exceedance based on 1988 (and 1995) data, but contaminant shown not to leach out of soil at unacceptable levels in 1995. Area M and Q exceedance based on 1995 data, but contaminant shown not to leach out of soil at unacceptable levels in 1995 testing.
α-BHC	Area M	20 (TMDL)	22	Area M exceedance based on 1995 data, but contaminant shown not to leach out of soil at unacceptable levels.

TABLE 3 - EXCEEDANCE OF SOIL CLEANUP STANDARDS FOR OTT/STORY/CORDOVA O.U. #3 PLANT AREA SOILS [1]
ALL VALUES ARE IN µg/kg (parts per billion, ppb) UNLESS OTHERWISE NOTED

CONTAMINANT	O.U. #3 AREA	20 X DW, DCV, or TMDL VALUE EXCEEDED[2]	CONTAMINANT CONC.	COMMENTS
β-BHC	Area M	20 (TMDL)	47	Area M exceedance based on 1995 data, but contaminant shown not to leach out of soil at unacceptable levels.
4,4'-DDT	Area F,G,R	200 (20 x DW)	2700, 5900, 1200 J	Area F, G, R, exceedances based on 1988 data, but contaminant not present at unacceptable levels based on later sampling and shown not to leach out of soil at unacceptable levels. There are other contributing factors[3] as to why Areas F,G, and R should be excavated.
	Area I, J	200 (20 x DW)	25000, 270 J	Area I,J exceedances based on 1988 data, but contaminant not present at unacceptable levels based on later sampling and shown not to leach out of soil at unacceptable levels.
Dieldrin	Area M	20 (TMDL)	190	Area M exceedance based on 1988 data, but contaminant not present at unacceptable levels based on later sampling.
	Area G	20 (TMDL)	140	Area G exceedance based on 1988 data, but contaminant not present at unacceptable levels based on later sampling. There are other contributing factors [3] as to why Area G should be excavated.
Endosulfan I	Area G	96 (20 x DW)	190	Area G exceedance based on 1992 data, but contaminant not present at unacceptable levels based on later sampling and shown not to leach out of soil at unacceptable levels. There are other contributing factors[3] as to why Area G should be excavated.
Endrin	Area G	40 (20 x DW)	97	Area G exceedance based on 1992 data, but contaminant not present at unacceptable levels based on later sampling and shown not to leach out of soil at unacceptable levels. There are other contributing factors[3] as to why Area G should be excavated.

TABLE 3 - EXCEEDANCE OF SOIL CLEANUP STANDARDS FOR OTT/STORY/CORDOVA O.U. #3 PLANT AREA SOILS [1]

CONTAMINANT	O.U. #3 AREA	20 X DW, DCV, or TMDL VALUE EXCEEDED[2] (ppb)	CONTAMINANT CONC. (ppb)	COMMENTS
Methoxychlor	Area K, Q	800 (20 x DW)	1300, 25000	Areas K and Q exceedances based on 1988 data, but contaminant shown not to leach out of soil at unacceptable levels.
	Area M	800 (20 x DW)	930	Area M exceedance based on 1988 data, but contaminant shown not to leach out of soil at unacceptable levels.
	Areas F,G	800 (20 x DW)	8400, 5300	Area F exceedance based on 1988 data, but contaminant not present at unacceptable levels based on later sampling. Area G based on 1988 (and 1995) data, but contaminant shown in 1995 not to leach out of soil at unacceptable levels. There are other contributing factors[3] as to why Areas F and G should possibly be excavated.
Arochlor 1248 (PCBs)	Area I,M,O	330 (TMDL)	1250, 15000, 3900	Area I exceedance based on 1994 data, Area M 1988 data, Area O 1992 data, but no exceedances in later sampling events (1995).
	Area G,R	330 (TMDL)	5800, 950	Area G and R exceedances based on 1992 data, but contaminant not present at unacceptable levels based on later sampling. There are other contributing factors[3] as to why Areas G and R should be excavated.
TCDD Toxicity Equivalent (Dioxin)	Area F	0.001 (TMDL)	0.77	Area F exceedance of 0.001 ppb TMDL is based on 1995 data, but the TMDL standard does not apply. The current State DCV ARAR of 0.99 ppb is applicable because it was shown that contaminant is not leaching at unacceptable levels. Contaminant concentration therefore does not exceed any State or Federal ARAR for industrial land use. Although it has been shown that Dioxin does not leach to groundwater at unacceptable levels, there are other contributing factors[3] for additional Area F sampling and possible excavation.
	Area G	0.001 (TMDL)	0.728	Area G exceedance of 0.001 ppb TMDL based on 1994 data. Detections of TCDD above the 0.001 ppb TMDL occurred in 1995 and 1996 sampling, but below the 1994 level, and there were no exceedances of any State or Federal standards, including the current State DCV ARAR (0.99 ppb) for industrial land use. Although it has been shown that Dioxin does not leach to groundwater at unacceptable levels, there are other contributing factors[3] for additional sampling of Area G and possible excavation.
	Areas M, P	0.001 (TMDL)	0.2, 0.128	Area M and P exceedances of 0.001 ppb TMDL is based on 1994 data, but no detections of TCDD occurred in 1995 and 1996 sampling, and it has been shown that Dioxin does not leach to groundwater at unacceptable levels

FOOTNOTES FOR TABLE 3

* An asterisk (*) denotes the confirmed exceedance of a current State standard (corresponding to 10^{-5} industrial risk). Excavation of soils is warranted in these areas based on addressing O.U. #3 risks associated with future industrial land use (identified in the 1993 ROD) and in accordance with State of Michigan standards.

1 Summarized in "Ott/Story/Cordova Site - Technical Memorandum for Soil and Sediment" dated April 1997 prepared by Black and Veatch for U.S. EPA.

2 20 x DW - 20 times the Part 201 Industrial drinking water standard. This is the contaminant concentration in soils which, if exceeded, may cause leaching of contaminants into groundwater at levels exceeding acceptable drinking water standards.
TMDL - The Target Method Detection Limit is the lowest value accepted by the State of Michigan that laboratory equipment can measure. If the 20 x DW value is lower than what the laboratory can detect, then the TMDL becomes the cleanup standard.
DCV - Part 201 Industrial Direct Contact Value. This is the contaminant concentration in soils which, if exceeded, presents an unacceptable risk to human health and the environment within a typical industrial scenario. Any exposure to plant area soils would be to an individual working on the Site within a controlled work environment.

3 40 CFR Section 300.430 (e)(2)(i)(A) requires U.S. EPA to establish remediation goals based on ARARs and additional factors including "...(4)[F]actors related to uncertainty; and (5) [O]ther pertinent information." The history of the Site in Area F (former incinerator area) including the historical detection of Dioxin, is enough basis to re-investigate and possibly excavate and dispose of soil. Although 1995 sampling confirmed that there was no exceedance of the State DCV standard in Area F, it is an O.U. #3 area that will be examined during implementation of the amended remedy. In Area G, specific visual confirmation of stressed vegetation by EPA contractors and demonstration of toxicity characteristics when subjected to Microtox biological testing in 1992 suggests an unacceptable threat to the environment. For the compound 4,4'-DDT, calculations for O.U. #3 in 1993 show a Hazard Index of 1.44 for age group 1 to 6 for a future Site resident. Although the reasonably anticipated future land use for the Site is industrial, the presence of 4,4'-DDT and associated toxicity is a consideration for excavation of Area G.

4 Residential Groundwater Criteria. In an Industrial scenario, the groundwater standard required by the State of Michigan for the compound Tetrachloroethene is the Residential Drinking Water Standard.

5 Estimated Cleanup Limit calculated by EPA contractor because no standard exists. This value may be used during implementation of the Remedial Action to assist in determining adequate excavation depth and is included here for comparison purposes.

DATA QUALIFIER LEGEND

When chemical analysis data is submitted to U.S. EPA, limitations of analytical equipment must be noted with results so an accurate scrutiny can be performed. These limitations are shown as qualifiers, noted as letters next to numerical values. Explanations of these qualifiers are as follows:

J - Signifies a value that was estimated. This means that the compound was detected by the analytical equipment but the value shown may not be able to be reproduced exactly if the analysis were repeated.

B - Signifies a compound that was also detected in a blank. A blank is a 'clean' sample prepared in the laboratory, carried with field samples, transported, and stored. If contamination is found in a blank, there is a possibility that contamination may be from a source other than what was sampled (such as through faulty sampling, storage, transportation, or laboratory procedures).

D - Signifies that the sample shown had to be diluted for the lab equipment to show results that are reproducible.

TABLE 4 - RISK ASSOCIATED WITH OTT/STORY/CORDOVA PLANT AREA SOILS AND LITTLE BEAR CREEK SYSTEM SEDIMENT AND SURFACE WATER (O.U. #3) [1]

RISKS IDENTIFIED FROM CONTAMINANTS OF CONCERN (EXCEPT DIOXIN) FROM BOTH SOILS AND SEDIMENTS*		
EXPOSED INDIVIDUAL	HAZARD INDEX [2]	LIFETIME CANCER RISK [3]
Current Resident and Trespasser	0.02	2 E -07
Future Worker	0.30	1 E -04
Future Construction Worker	0.46	3 E -06
Future Maintenance Worker	0.40	9 E -05
Future Resident	2.4	3 E -04
CUMULATIVE RISK IDENTIFIED FOR CONTAMINANTS FOUND IN SOILS [1]		
EXPOSED INDIVIDUAL	RISK ATTRIBUTED TO DIOXIN (0.77 ppb max)	TOTAL LIFETIME CANCER RISK [3]
Future Worker	5.15 E -05	1.52 E -04
Future Construction Worker	6.71 E -06	9.71 E -06
Future Maintenance Worker	1.10 E -04	2.0 E -04
Future Resident	2.81 E -04	5.81 E -04

FOOTNOTES FOR TABLE 4

* There was no Dioxin ever detected in Creek sediment.

1 As calculated in the document "Ott/Story/Cordova Operable Unit #3 - Final Risk Assessment Technical Memo" dated December, 1992, prepared by Black and Veatch for U.S. EPA and corrected on December 7, 1997.

2 When the Hazard Index (HI) is greater than 1, there is a potential for health problems such as damage to vital organs, birth defects, and anemia and other blood disorders. U.S. EPA and the State of Michigan may perform Remedial Actions if an HI is 1.0 or above.

3 Using a basis of a 70 year life time. A 1.0 E -06 cancer risk value corresponds to a 1 in 1,000,000 chance that an individual develops cancer as a result of exposure to these concentrations of contaminants over a period of 70 years. Similarly, 1.0 E -05 corresponds to a 1 in 100,000 chance, 1.0 E -04, 1 in 10,000, and so on. U.S. EPA may perform a Remedial Action if cancer risks are greater than 1.0 E -04. The State of Michigan is required to take action at a cancer risk of 1.0 E -05 or greater.

4 "Current Resident and Trespasser" presumes exposure for an individual by ingestion and dermal contact with contaminants in Creek bank sediments and Site soils during trespassing events for the current Site conditions. "Future Worker" assumes exposure to Site surface soils during industrial production activity over 8 hours per day (such as chemical production or factory work). "Future Construction Worker" represents an individual exposed to Site surface and subsurface soils for 8 hours per day for one year during construction activity required for capital projects. "Future Maintenance Worker" signifies an individual who would be performing maintenance such as landscaping, building dismantling, and railroad spur upkeep during an average six months per year. "Future Resident" assumes daily exposure to Site soils for an individual living in a residence located on the Site 350 days per year. All scenarios are in accordance with U.S. EPA risk assessment guidance.

TABLE 4A - OTT/STORY/CORDOVA OPERABLE UNIT #3 SOILS AND SEDIMENTS TOTAL RISK - CURRENT RESIDENT AND TRESPASSER [1]

CHEMICAL[3]	NONCARCINOGENIC HAZARD QUOTIENT[4] AGE GROUP		EXCESS LIFETIME CANCER RISK [2] 70 YEAR LIFE TIME
	1 - 6	7 - 30	
1,1,2-Trichloroethane			8.00e-10
Benzene	-	-	7.00e-08
Chloroform	-	-	7.00e-13
Methylene Chloride	-	-	3.00e-11
Tetrachloroethene	-	-	1.00e-09
1,4-Dichlorobenzene	-	-	2.00e-10
bis-(2-ethylhexyl) phthalate	-	-	3.00e-09
Hexachlorobenzene	-	-	1.00e-07
n-Nitrosodiphenylamine	-	-	6.00e-11
4,4'-DDT	-	-	2.00e-08
	AGE GROUP HAZARD INDEX		CANCER RISK
	0.01	0.00	2.00e-07
	TOTAL HAZARD INDEX 0.02		

FOOTNOTES FOR TABLE 4A

1 As calculated in the document "Ott/Story/Cordova Operable Unit #3 - Final Risk Assessment Technical Memorandum" dated December, 1992, prepared by Black and Veatch for U.S. EPA.

2 "Current Resident and Tresspasser" presumes exposure for an individual by ingestion and dermal contact with contaminants in Creek bank sediments and Site soils during trespassing events for the current Site conditions, in accordance with U.S. EPA risk assessment guidance.

3 Contaminants shown were those consistently detected within Site characterization data.

4 '-' indicates either no toxicity value, or the estimated hazard quotient is less than 0.01.

TABLE 4B - OTT/STORY/CORDOVA OPERABLE UNIT #3 SOILS AND SEDIMENTS TOTAL RISK[1] - FUTURE WORKER[2]

CHEMICAL[4]	NONCARCINOGENIC HAZARD QUOTIENT[5] FUTURE WORKER	EXCESS LIFETIME CANCER RISK [3] 70 YEAR LIFE TIME
1,2-Dichloroethane	-	2.00e-09
Tetrachloroethene	-	1.00e-09
Benzo(a)pyrene	-	4.00e-06
Benzo(b)fluoranthene	-	3.00e-06
Benzo(k)fluoranthene	-	2.00e-06
bis-(2-ethylhexyl) phthalate	-	9.00e-09
Chrysene	-	3.00e-06
Hexachlorobenzene	0.01	5.00e-06
n-Nitrosodiphenylamine	-	3.00e-09
4,4'-DDT	0.26	2.00e-05
Aldrin	-	9.00e-07
Aroclor 1248 (PCBs)	-	8.00e-05
	HAZARD INDEX	CANCER RISK
	0.30	1.00e-04

FOOTNOTES FOR TABLE 4B

1 As calculated in the document "Ott/Story/Cordova Operable Unit #3 - Final Risk Assessment Technical Memorandum" dated December, 1992, prepared by Black and Veatch for U.S. EPA.

2 "Future Worker" assumes exposure to Site surface soils during activity such as industrial production acti· , over 8 hours per day (such as chemical production or factory work), .n accordance with U.S. EPA guidance.

3 Risks shown assume possible exposure by ingestion and dermal contact with contaminants by contact with soils on the facility.

4 Contaminants shown were those consistently detected within Site characterization data.

5 '-' indicates either no toxicity value, or the estimated hazard quotient is less than 0.01.

TABLE 4C - OTT/STORY/CORDOVA OPERABLE UNIT #3 SOILS AND SEDIMENTS TOTAL RISK[1] - FUTURE CONSTRUCTION WORKER[2]

CHEMICAL[4]	NONCARCINOGENIC HAZARD QUOTIENT[5] FUTURE WORKER	EXCESS LIFETIME CANCER RISK [3] 70 YEAR LIFE TIME
1,2-Dichloroethane	-	1.00e-10
Tetrachloroethene	-	6.00e-11
Benzo(a)pyrene	-	3.00e-07
Benzo(b)fluoranthene	-	2.00e-07
Benzo(k)fluoranthene	-	1.00e-07
bis-(2-ethylhexyl) phthalate	-	8.00e-10
Chrysene	-	2.00e-07
Hexachlorobenzene	-	2.00e-07
n-Nitrosodiphenylamine	-	2.00e-10
4,4'-DDT	0.40	1.00e-06
Aldrin	-	2.00e-08
Aroclor 1248 (PCBs)	-	1.00e-06
Arsenic	0.02	-
	HAZARD INDEX	CANCER RISK
	0.46	3.00e-06

FOOTNOTES FOR TABLE 4C

1 As calculated in the document "Ott/Story/Cordova Operable Unit #3 - Final Risk Assessment Technical Memorandum" dated December, 1992, prepared by Black and Veatch for U.S. EPA.

2 Future construction and maintenance worker assumes exposure to Site surface and subsurface soils during work activity on the Site. "Future Construction Worker" represents an individual exposed to Site surface and subsurface soils for 8 hours per day for one year during construction activity required for capital projects, in accordance with U.S. EPA risk assessment guidance.

3 Risks shown assume possible exposure by ingestion and dermal contact with contaminants by contact with soils on the facility.

4 Contaminants shown were those consistently detected within Site characterization data.

5 '-' indicates either no toxicity value, or the estimated hazard quotient is less than 0.01.

TABLE 4D - OTT/STORY/CORDOVA OPERABLE UNIT #3 SOILS AND SEDIMENTS TOTAL RISK[1] - FUTURE MAINTENANCE WORKER[2]

CHEMICAL[4]	NONCARCINOGENIC HAZARD QUOTIENT[5] FUTURE WORKER	EXCESS LIFETIME CANCER RISK[3] 70 YEAR LIFE TIME
1,2-Dichloroethane	-	2.00e-09
Tetrachloroethene	-	1.00e-09
Benzo(a)pyrene	-	6.00e-06
Benzo(b)fluoranthene	-	3.00e-06
Benzo(k)fluoranthene	-	2.00e-06
bis-(2-ethylhexyl) phthalate	-	1.00e-08
Chrysene	-	3.00e-06
Hexachlorobenzene	-	4.00e-06
n-Nitrosodiphenylamine	-	4.00e-09
4,4'-DDT	0.33	2.00e-05
Aldrin	-	7.00e-07
Aroclor 1248 (PCBs)	-	5.00e-05
Arsenic	0.01	-
	HAZARD INDEX	CANCER RISK
	0.40	9.00e-05

FOOTNOTES FOR TABLE 4D

1 As calculated in the document "Ott/Story/Cordova Operable Unit #3 - Final Risk Assessment Technical Memorandum" dated December, 1992, prepared by Black and Veatch for U.S. EPA.

2 Future construction and maintenance worker assumes exposure to Site surface and subsurface soils during work activity on the Site. "Future Maintenance Worker" signifies an individual who would be performing maintenance such as landscaping, building dismantling, and railroad spur upkeep during an average six months per year, in accordance with U.S. EPA risk assessment guidance.

3 Risks shown assume possible exposure by ingestion and dermal contact with contaminants by contact with soils on the facility.

4 Contaminants shown were those consistently detected within Site characterization data.

5 '-' indicates either no toxicity value, or the estimated hazard quotient is less than 0.01.

TABLE 4E -OTT/STORY/CORDOVA OPERABLE UNIT #3 SOILS AND SEDIMENTS TOTAL RISK[1] - FUTURE RESIDENT[2]

CHEMICAL[4]	NONCARCINOGENIC HAZARD QUOTIENT[5] AGE GROUP		EXCESS LIFETIME CANCER RISK[3] 70 YEAR LIFE TIME
	1 - 6	7 - 30	
1,2-Dichloroethane	-	-	5.00e-08
Tetrachloroethene	-	-	3.00e-08
Benzo(a)pyrene	-	-	1.00e-05
Benzo(b)fluoranthene	-	-	8.00e-06
Benzo(k)fluoranthene	-	-	5.00e-06
bis-(2-ethylhexyl) phthalate	-	-	3.00e-08
Chrysene	-	-	7.00e-06
Hexachlorobenzene	0.06	0.02	1.00e-05
n-Nitrosodiphenylamine	-	-	8.00e-09
4,4'-DDT	1.44	0.41	4.00e-05
Aldrin	0.03	-	3.00e-06
Aroclor 1248 (PCBs)	-	-	2.00e-04
Methoxychlor	0.05	0.01	-
Arsenic	0.08	0.01	-
Cadmium	0.07	-	-
Chromium	0.08	0.01	-
Manganese	0.02	-	-
Mercury	0.01	-	-
Nickel	0.03	-	-
Vanadium	0.04	-	-
	AGE GROUP HAZARD INDEX		CANCER RISK
	1.9	0.5	3.00e-04
	TOTAL HAZARD INDEX 2.4		

FOOTNOTES FOR TABLE 4E

1 As calculated in the document "Ott/Story/Cordova Operable Unit #3 - Final Risk Assessment Technical Memorandum" dated December, 1992, prepared by Black and Veatch for U.S. EPA.

2 "Future Resident" assumes daily exposure to Site soils for an individual living in a residence located on the Site 350 days per year, in accordance with U.S. EPA risk assessment guidance.

3 Risks shown assume possible exposure by ingestion and dermal contact with contaminants in Creek bank sediments and contact with soils on the facility.

4 Contaminants shown were those consistently detected within Site characterization data.

5 '-' indicates either no toxicity value, or the estimated hazard quotient is less than 0.01.

TABLE 5A - HISTORICAL COMPARISON OF LITTLE BEAR CREEK SEDIMENT CONTAMINATION AT LOCATIONS 15 TO 34[1]
ALL VALUES ARE µg/kg (parts per billion, ppb) UNLESS OTHERWISE NOTED

CONTAMINANT	PRE-1996 [2]	DECEMBER 1996	MARCH 1997
Acetone	7420	255	3100
Benzene	47500	4370	12000
2-Butanone	587	ND	240
Carbon Disulfide	46.2 J	ND	ND
Chlorobenzene	3090	ND	1000
Chloroethane	1390	609	1100
Chloroform	18.2	ND	ND
Chloromethane	61.3 J	ND	ND
1,2-Dichlorobenzene	969 J	215	97
1,4-Dichlorobenzene	-	ND	ND
1,1-Dichloroethane	67 J	170	2200
1,2-Dichloroethane	7.25 J	ND	320
Ethylbenzene	854	ND	53
2-Hexanone	31.1 J	ND	ND
Methylene Chloride	346 B	ND	620
4-Methyl-2-Pentanone	173 J	ND	ND
1,1,2,2-Tetrachloroethane	-	349.2	1011
Tetrachloroethene	591 B	ND	ND
Toluene	53100	3440	14000
Trichloroethene	57	ND	100
Vinyl Chloride	-	ND	1200
Vinyl Acetate	20 J	ND	ND
Xylenes (total)	5040	275	1200
Benzoic Acid	3640 J	ND	ND
Benzo(a)Pyrene	286 J	ND	ND
bis (2-Ethylhexyl) phthalate	575 J	218	ND
Butylbenzylphthalate	19200	ND	ND
4-Chloroaniline	1040 J	2481	7100
Di-n-Butylphthalate	344 J B	3026	4400
Dibenzofuran	394 J	ND	ND
Diethylphthalate	-	ND	ND
Fluoranthene	88.9 J	ND	ND

TABLE 5A - HISTORICAL COMPARISON OF LITTLE BEAR CREEK SEDIMENT CONTAMINATION AT LOCATIONS 15 TO 34[1]
ALL VALUES ARE ug/kg (parts per billion, ppb) UNLESS OTHERWISE NOTED

CONTAMINANT	PRE-1996 [2]	DECEMBER 1996	MARCH 1997
2-Methylphenol	550 J	ND	ND
4-Methylphenol	-	ND	ND
N-nitrosodiphenylamine	-	166	ND
Phenol	-	ND	ND
Pyrene	81.1 J	ND	ND
4,4'-DDT	8.42 J	ND	ND
Dieldrin	10.5	ND	ND
Endosulfan II	1.85 J	ND	ND

ND - Not detected.

FOOTNOTES FOR TABLE 5A

1 Locations are representative as shown in Figure 4 and can be compared against the recent quarterly monitoring sample locations SD-53 through SD-59. A final determination of Creek quality and contaminant attenuation can not be made until an adequate number of quarterly sampling events have occurred.

2 Pre-1996 sediment information summarized in Table 2.

DATA QUALIFIER LEGEND

When chemical analysis data is submitted to U.S. EPA, limitations of analytical equipment must be noted with results so an accurate scrutiny can be performed. These limitations are shown as qualifiers, noted as letters next to numerical values. Explanations of these qualifiers are as follows:

J - Signifies a value that was estimated. This means that the compound was detected by the analytical equipment but the value shown may not be able to be reproduced exactly if the analysis were repeated.

B - Signifies a compound that was also detected in a blank. A blank is a 'clean' sample prepared in the laboratory, carried with field samples, transported, and stored. If contamination is found in a blank, there is a possibility that contamination may be from a source other than what was sampled (such as through faulty sampling, storage, transportation, or laboratory procedures).

D - Signifies that the sample shown had to be diluted for the lab equipment to show results that are reproducible.

TABLE 5B - HISTORICAL COMPARISON OF LITTLE BEAR CREEK WATER CONTAMINATION * ALL VALUES ARE ug/kg (parts per billion, ppb) UNLESS OTHERWISE NOTED

CONTAMINANT	PRE-1996	DECEMBER 1996	MARCH 1997
Acetone	920 J	ND	10
Benzene	6000 J	29	8.6
2-Butanone	-	ND	ND
Chlorobenzene	82 J	ND	ND
Chloroethane	1000 J	3	ND
1,1-Dichloroethane	26	1	ND
1,2-Dichloroethane	140	ND	ND
Toluene	6400	15	4.5
Vinyl Chloride	52	ND	ND
Xylenes (total)	36 J	ND	ND
Aniline	17 J	ND	ND
bis (2-Ethylhexyl) phthalate	-	ND	ND
4-Chloroaniline	2400 D J	ND	ND
2-Methylphenol	32 J	ND	ND
4-Methylphenol	330 J	ND	ND
4,4'-DDD	0.13 J	ND	ND
4,4'-DDE	0.01 J	ND	ND
4,4'-DDT	0.088 J	ND	ND
Dieldrin	0.072 J	ND	ND
Endosulfan I	0.016 J	ND	ND
Heptachlor Epoxide	0.013 J	ND	ND

ND - Not detected.

* Surface water samples taken between confluence with unnamed tributary and River Road. This is representative and can be compared against the recent quarterly monitoring program location SW-13. A final determination of Creek quality and contaminant attenuation can not be made until an adequate number of quarterly sampling events have occurred.

DATA QUALIFIER LEGEND

When chemical analysis data is submitted to U.S. EPA, limitations of analytical equipment must be noted with results so an accurate scrutiny can be performed. These limitations are shown as qualifiers, noted as letters next to numerical values. Explanations of these qualifiers are as follows:

J - Signifies a value that was estimated. This means that the compound was detected by the analytical equipment but the value shown may not be able to be reproduced exactly if the analysis were repeated.

B - Signifies a compound that was also detected in a blank. A blank is a 'clean' sample prepared in the laboratory, carried with field samples, transported, and stored. If contamination is found in a blank, there is a possibility that contamination may be from a source other than what was sampled (such as through faulty sampling, storage, transportation, or laboratory procedures).

D - Signifies that the sample shown had to be diluted for the lab equipment to show results that are reproducible.

TABLE 6 - COMPARISON OF ORIGINAL REMEDY ALTERNATIVES AS CITED IN ORIGINAL O.U. #3 ROD

DESCRIPTION OF ALTERNATIVE	NINE CRITERIA									
	Protection of Human Health & Environment	Compliance with ARARs	Long Term Effectiveness and Permanence	Reduction of Toxicity, Mobility, or Volume by Treatment	Short Term Effectiveness	Implementability	Cost	State Accept-ance	Community Acceptance	TOTAL
Alt. #1 - No Action			N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Alt. #2 - Institutional Controls			N/A	N/A	N/A	N/A	N/A	N/A	N/A	0
Alt. #3a - Excavation and On-Site RCRA D (Act 641) Landfill	XX	XX	XX			XX	XX			5
Alt. #3b - Excavation and On-Site RCRA C (Act 64) Landfill	XX	XX	XX			XX				4
Alt. #4 - Excavation and Off-Site Disposal in a Landfill	XX	XX				XX	XX			4
Alt. #5 - Excavate & Off-Site Disposal by Incineration	XX	XX	XX	XX		XX				5
Alt. #6 - Excavate and On-Site LTTD Treatment	XX	XX	XX	XX		XX	XX	XX	XX	8
Alt. #7 - Combination of On-Site Landfill with Off-Site Disposal (Incin. and Landfill)	XX	XX	XX	XX		XX	XX			6

TABLE 7 - ESTIMATED COST ALLOWANCE BASED ON WORST CASE EXCAVATION DEPTH AND OFF-SITE DISPOSAL FOR THE AMENDED O.U. #3 REMEDY

ESTIMATED WORST-CASE SOIL VOLUME;	Area F = 1600 yd^2	2 feet excavation depth = 0.67 yd	Subtotal = 1072 yd^3
	Area G = 4700 yd^2	2 feet excavation depth = 0.67 yd	Subtotal = 3149 yd^3
	Area R = 5800 yd^2	1 feet excavation depth = 0.33 yd DRY	Subtotal = 1914 yd^3
		2 feet excavation depth = 0.67 yd 'WET'	Subtotal = 3886 yd^3
			TOTAL VOLUME OF SOILS = 10,021 yd^3

Landfill will likely be in the State of Michigan, therefore tax = $ 0

1072 yd^3 x ($ 140 / yd^3 RCRA disposal + $ 30 / yd^3 trans. + $ 0 tax) = $ 182,240
3149 yd^3 x ($ 140 / yd^3 RCRA disposal + $ 30 / yd^3 trans. + $ 0 tax) = $ 535,330
1914 yd^3 x ($ 140 / yd^3 RCRA disposal + $ 30 / yd^3 trans. + $ 0 tax) = $ 325,380
3886 yd^3 x ($ 140 / yd^3 RCRA disposal + $ 30 / yd^3 trans. + $ 0 tax + $ 250 / yd^3 stabilization) = $ 1,632,120

TOTAL DISPOSAL COST (HAZ Landfill) = $ 2,675,070

Incineration Cost = (1072 + 3149 + 1914 + 3886 yd^3) x ($ 600 / yd3 + $ 6 / yd3 trans. + $ 60 / yd3 tax) = $ 6,673,986

TASK	UNIT COST [1]	QUANTITY	LANDFILL ESTIMATED COST	INCIN. ESTIMATED COST
Excavation & Earth Work [2]	$ 6.50 / yd^3	10,021 yd^3	$ 65,137	$ 65,137
Buried Drums/Tanks Removal	$ 19,100 [4]	N/A	$ 19,100	$ 19,100
Sub-Total			$ 84,237	$ 84,237
Contractor O/H & Profit (15%)			$ 12,636	$ 12,636
Sampling of Excavated Areas	$ 1,330 / sample	22 samples	$ 29,260	$ 29,260
Disposal (Landfill) [3]	See Above	See Above	$ 2,675,070	-
Disposal (Incineration) [3]	See Above	See Above	-	$ 6,673,986
Fencing [4]	$ 7.43 / foot	6400 feet	$ 47,552	$ 47,552
Institutional Control (Zoning/Permit)[5]	-	-	$ 11,260	$ 11,260
Backfill (Clean Native Soil) [6]	$ 9.30 per yd^3	10,021 yd^3	$ 93,195	$ 93,195
Emission Controls	$ 2.25 per yd^2	12,100 yd^2	$ 27,225	$ 27,225
Air Monitoring [7]			$ 390,000	$ 390,000
Sub-total			$ 3,370,435	$ 7,369,351
Contingency (20 %)			$ 674,087	$ 1,473,870
TOTAL			$ 4,044,522	$ 8,843,221

FOOTNOTES FOR TABLE 7

1 Unless otherwise noted, all estimates shown have been taken from the Final Design Cost Estimate dated 3/6/95 developed for the LTTD Remedial Design increased to reflect inflation to Year 1997.

2 U.S. EPA support contractor estimate dated 11/22/96 based on average unit cost over all 22 excavation areas from RD LTTD cost estimate.

3 Landfilling and incineration cost estimates were obtained by telephone quotations on or about October, 1996, by U.S. EPA RD support contractor.

4 This estimate is based on installation of fencing and signage around the entire Site property boundary (including labor). This allowance may be used for installation of new equipment or upgrade of exisitng Site security (to be determined in the field during construction).

5 Estimate is based on $ 10,000 allowance provided in Feasibility Study dated March 1993, increased to reflect inflation to 1997.

6 Fill volume is equal to excavated volume shown above.

7 This estimate includes Health and Safety air monitoring (portable equipment), full laboratory analysis for VOCs, PCBs, Dioxins/Furans, and meteorological monitoring fcr one year.

TABLE 8 - O&M COST ESTIMATE FOR O.U. #3 AMENDED REMEDY

ITEM	UNIT COSTS	TOTAL COST / YEAR
Periodic Inspection of Excavated / Filled Areas [1]	$ 1,280 / event (2 events per year)	$ 2,560
Maintenance of Fence and Signage [2]	$ 1,120 / event (1 event per year)	$ 1,120
Little Bear Creek Quarterly Monitoring (Surface Water / Sediment Sampling and Analysis) [3]	$ 20,000 (every 3 months - 4 times per year total)	$ 80,000
Sub-Total		$ 83,680
CONTINGENCY (20%)		$ 16,736
TOTAL		$ 100,416

1 Estimated by U.S. EPA as : $ 80 /hr per person x 8 hrs x 2 people = $ 1,280 (including travel and other misc. costs)

2 Estimated by U.S. EPA as : $ 70 / hr per person x 8 hours x 2 people = $ 1,120 (local fencing crew - 2 people)

3 Estimate calculated by U.S. EPA contractor.

TABLE 9 - PRESENT WORTH CALCULATION FOR O.U. #3 AMENDED REMEDY

TIME PERIOD FOR PRESENT WORTH ANALYSIS	30 years	100 years
DISCOUNT RATE FOR PW	5 %	5 %
P/A FACTOR (See Table 8A)	15.37	19.85
Annual O&M Costs	$ 100,416	$ 100,416
PRESENT WORTH OF O&M	$ 1,543,394	$ 1,993,258
NET PRESENT WORTH (INCLUDING CAPITAL COST)	$ 5,587,916 - Landfill $ 10,386,615 - Incineration	$ 6,037,780 - Landfill $ 10,836,479 - Incineration

TABLE 9A - Present Worth Formula

Because different remedial alternatives have different operating costs and time periods, it is necessary to provide some equivalent value between alternatives for comparison purposes. The present worth of an alternative is a measure of how much money will have to be put aside now to provide for one or more future expenditures. To find the present worth of a series of cash disbursements (such as annual O&M), it is necessary to discount future amounts to the present by using an interest rate (for the appropriate number of years) in the following manner:

(1) $$\text{Present Worth} = F_0(1+i)^0 + F_1(1+i)^{-1} + \ldots + F_k(1+i)^{-k} + \ldots + F_n(1+i)^{-n}$$

where F_k = future cash flow at end of period k
i = interest rate
k = index for each compounding period ($0 \leq k \leq n$)
n = number of years
A = annual cost (O&M cost)

This series is summarized by the following equations:

(2) Total P.W. = Capital Cost + Present Worth of Annual Cost

(3) P.W. of Annual Cost = Annual Cost x P/A Factor

(4) $$\frac{P}{A} = \frac{(1+i)^n - 1}{i(1+i)^n}$$

Thus, for the second column of Table 9 ($ 100,416 for 30 yrs. @ 5%):

$$\frac{P}{A} = \frac{(1+i)^n - 1}{i(1+i)^n} = \frac{(1+0.05)^{30} - 1}{0.05*(1+0.05)^{30}} = 15.37$$

and

P.W. of O&M = $ 100,416 x 15.37 = $ 1,543,394

and

Total P.W. of Landfilling Alternative = $ 4,044,522 (from Table 6) + $ 1,543,394 = $ 5,587,916

Source: Engineering Economy, 7th ed., DeGarmo, Sullivan, Canada, Macmillan Publishing, 1984.

APPENDIX A

Discussion of ARARs - Ott/Story/Cordova O.U. #3

The 1993 ROD discusses ARARs that may no longer be appropriate in light of revisions to the remedy. For example, ARARs dealing with control of emissions from an on-Site incinerator or LTTD remedy need not be complied with, as the fundamental change will not include incineration or any other thermal treatment component. Similarly, ARARs concerning design and construction of waste containment structures are no longer relevant or appropriate.

As part of the re-evaluation process, U.S. EPA has reviewed ARARs put forth within the OU #3 ROD. Substantive provisions of the following statutes and regulations may or may not be ARARs for this operable unit as discussed below:

a. Federal

1. Action Specific:

a. Clean Water Act, as amended [33 U.S.C. § 1251]:
The National Pollutant Discharge Elimination System (NPDES) specifies the substantive requirements for discharges into surface waters, including effluent standards and limitations. 40 CFR 122, 125 and 136 establish guidelines and procedures for the National Pollutant Discharge Elimination System (NPDES). The NPDES program is administered by MDEQ.

These substantive requirements are applicable only to the groundwater treatment plant (GWTP) portion of the overall Site remedy. The GWTP has been designed to satisfy, and has been satisfying, the discharge requirements identified by MDEQ. For the purposes of this ROD Amendment, however, O.U. #3 soils removal does not need to comply with this ARAR.

b. Clean Air Act, as amended [42 U.S.C. § 7401]:
The Clean Air Act was enacted to protect and enhance air quality. 40 CFR 6 provides that all Federal projects, licenses, permits, plans, and financial assistance activities conform to any State Air Quality

Implementation Plan (SIP). 40 CFR Part 50 establishes primary and secondary ambient air quality standards that are applicable to emissions generated during construction activities. It is anticipated that construction of the amended O.U. #3 remedy would have to comply with this ARAR by minimization of fugitive dusts or other emissions created from excavation and back-filling activity. U.S. EPA anticipates that adequate dust and emission control methods will be used to insure that this ARAR is met.

2. Location Specific:

a. Section 10 of the Federal River and Harbor Act, as amended:

This Act regulates obstruction or alteration of any navigable water in the United States, including connected wetlands. These requirements are implemented through 33 CFR Parts 320-330. Activity for this O.U. #3 remedy could potentially affect Little Bear Creek and its unnamed tributary and/or connected wetlands, this statute would be an ARAR if construction activities pose a potential impact on the Creek and/or the wetlands. It is expected, however, that this O.U. #3 remedy will not disrupt any navigable water or connecting wetlands. In the event it appears during construction that this remedy would disrupt such navigable waters, U.S. EPA will provide for any necessary mitigative measures to comply with this ARAR.

b. Clean Water Act (CWA) of 1977, as amended, [33 U.S.C. 1344], 33 CFR 322:

Section 404 of the Clean Water Act also specifically establishes limitations on the discharge of dredged or fill material into surface waters, including adjacent wetlands. The O.U. #3 remedy will comply (or has complied) with the substantive requirements of this ARAR by subjecting construction documentation to review by appropriate authority.

Executive Orders 11988 40 CFR 6 similarly requires that construction activities avoid long- and short-term adverse impacts associated with actions in the wetland

or floodplain areas. This remedy would necessarily need to comply with this ARAR during construction activities as previously discussed.

3. Chemical Specific:

a. Clean Water Act [33 U.S.C. 1251], Toxic Pollutant Effluent Standards [40 CFR 129]:

Title 40, Part 129 of the Code of Federal Regulations establishes toxic pollutant effluent standards and prohibitions of specific compounds for specified facilities discharging into navigable waters. 40 CFR 129.104 sets ambient water criterion for certain contaminants in navigable water. These standards may be ARARs for discharges from the GWTP that is being used for the overall Site remedy. As noted previously, the groundwater treatment facility has been designed to satisfy, and has been satisfying, these requirements. Although the O.U. #3 remedy does not directly deal with the GWTP, this Remedial Action is not inconsistent with compliance with this ARAR.

b. Resource Conservation and Recovery Act, Subtitle C (42 U.S.C. § 6901):

RCRA ARARs are applicable to this Site only in the context of off-site disposal of excavated soils which may exhibit one of the characteristics of hazardous waste as defined in 40 CFR 261.21 -261.24. Based upon site characterization data, excavated soils are not expected to exhibit any of the characteristics of hazardous waste. If any of the excavated soils exhibit one or more of the characteristics of hazardous wastes, proper treatment will be employed to remove the characteristic and allow for appropriate disposal. It is expected that after treatment the soils will not require disposal in a RCRA Subtitle C landfill. Although Part A and B of the application for a RCRA permit was submitted to U.S. EPA for the storage in containers of several wastes listed in 40 CFR 261.31-261.33 (suggesting possible on-Site generation of hazardous wastes so listed), and there is evidence from former employees of improper disposal practices, there is no evidence directly linking waste material at the

time of disposal to known listed wastes. The processes that produced the wastes are largely unknown. Therefore the excavated soils are not considered listed hazardous wastes based upon currently available information.

c. Safe Drinking Water Act (SDWA) of 1974 (42 U.S.C. 300(f)), as amended:

The Safe Drinking Water Act was enacted to assure high quality drinking water in public water supplies. Specifically, 40 CFR 141 specifies maximum chemical contaminant levels (MCLs) for inorganic and organic chemicals, maximum contaminant level goals (MCLGs) for organic chemicals, and establishes national revised primary drinking water regulations of MCLs for organic chemicals. Surface water in Little Bear Creek, its unnamed tributary, and groundwater in the Site vicinity are not currently distributed through the public water supply systems. Therefore, these regulations are not applicable to the Site. Because, however, the surface water and groundwater aquifer are potential sources of drinking water, the MCLs and the non-zero MCLGs may be relevant and appropriate requirements for the Site. The final decision in this regard for groundwater will be made in the future, after U.S. EPA has assessed current remedy operations and estimated time frames as well as long term cleanup goals for the overall Site. MCLs have been assumed as cleanup goals in cost calculations under Site remedy decision documents to date. As noted above, the groundwater treatment facility currently satisfies MCLs and all other discharge limitations to the Muskegon River. Again, because this fundamental change to the O.U. #3 remedy will deal with soils removal (which is directly associated with contamination of groundwater), the amended Remedial Action will comply with requirements of this ARAR.

d. Regulations for Hazardous Waste Generators and Michigan Hazardous Waste Management Rules, Part 3, R299.9301 to 9309; "Generators of Hazardous Wastes," 40 CFR 262 ;

As identified in the 1993 ROD, this is an ARAR for the amended O.U. #3 Remedial Action because it is possible that excavation spoils may need to be handled and shipped as RCRA hazardous wastes.

b. State

1. Action Specific

a. Part 31 of the Natural Resources and Environmental Protection Act, PA 451 of 1994, as amended, (formerly Act 245 of the Public Acts of 1929, as amended; Water Resources Commission Act;

The National Pollutant Discharge Elimination System (NPDES) is implemented by the MDEQ, which administers and specifies the substantive requirements for discharges into surface waters, including effluent standards and limitations under Part 21 of the Administrative Rules. Part 4 of the Administrative Rules, Rule 57 also establishes water quality standards for all waters of the state. Those requirements establish limits for discharge of dissolved solids, pH, taste and odor producing substances, toxic substances, nutrients and dissolved oxygen.

These substantive requirements are applicable to the overall Site remedy as it includes extraction, treatment, and discharge of groundwater off-Site to the Muskegon River in accordance to the NPDES permit issued for the GWTP. The groundwater treatment facility has been designed to satisfy, and has been satisfying, these discharge requirements identified by MDEQ. Both remedy alternatives will therefore comply with this ARAR. Because the fundamental change to the O.U. #3 remedy will deal with soils removal (wnich is directly associated with contamination of groundwater), the amended Remedial Action will comply with requirements of this ARAR.

b. Part 55 of the Natural Resources and Environmental Protection Act, PA 451 of 1994, as amended, (formerly Act 348 of the Public Acts of 1965, as amended, Air Pollution Act; Part 3);

This law establishes standards for the density of

emissions and emission of particulate matter. The fundamental change to the O.U. #3 remedy requires some degree of excavation, resulting in agitation of Site soils. This Remedial Action will likely require some degree of emissions control during construction.

For dust control, the most effective method is wet suppression using water alone, or a chemical suppressant in water. This will capture soil particles, and will inhibit migration of volatile and semi-volatile vapor. At the end of each daily construction period, excavation and stockpile areas will be covered appropriately to prevent releases during off-hours. In the event wet suppression alone does not adequately control Site emissions to within required levels, it will be possible to perform further controls as discussed above, including erection of wind screens. It is expected that by using these measures, the fundamental O.U. #3 remedy change will comply with the substantive requirements of this ARAR.

c. Part 55 of the Natural Resources and Environmental Protection Act, PA 451 of 1994, as amended, (formerly Act 348 of the Public Acts of 1965, as amended, Air Pollution Act); Part 7, R336.1702; New Sources of VOC Emissions:
This was identified in the 1993 ROD, but is no longer an ARAR as the amended O.U. #3 remedy no longer requires any thermal treatment.

2. Location Specific:
a. Part 303 of the Natural Resources and Environmental Protection Act, PA 451 of 1994, as amended, (formerly Act 203 of the Public Acts of 1979, The Goemaere-Anderson Wetland Protection Act);
These rules apply to activities that result in potential discharge to any wetland area around Little Bear Creek and its unnamed tributary. These rules include permitting requirements, wetland determination, and mitigation. The amended O.U. #3 remedy will include all necessary procedures needed to comply with this statute. These requirements will be included

within the modified design for the O.U. #3 amended remedy.

b. Part 91 of the Natural Resources and Environmental Protection Act, PA 451 of 1994, as amended, (formerly Act 347 of the Public Acts of 1972, Soil Erosion and Sedimentation Control Act):
Part 17 of the Administrative Rules, Soil Erosion and Sedimentation Control, establishes general soil erosion and sedimentation control procedures and measures, as well as earth change requirements and soil conservation district standards and specifications. The modification to the O.U. #3 remedy may result in agitation of one or more acres of land within 500 feet of a stream. Therefore, these are relevant and appropriate, and the amended O.U. #3 remedy will incorporate the requirements of this statute.

3. Chemical Specific:
a. Part 31 of the Natural Resources and Environmental Protection Act, PA 451 of 1994, as amended, (formerly Act 245 of the Public Acts of 1929, as amended, Water Resources Commission Act), Administrative Rules Part 4, Rule 323.1057 (Rule 57), Water Quality Standards (Surface Water Quality Standards):
Part 31 of NREPA, Part 4, Rule 57 establishes limits for all waters of the State. Standards for toxic substances are established on a site-specific basis. As noted above, the groundwater treatment facility recently constructed is currently required to, and does, satisfy discharge limitations to the Muskegon River. The amended O.U. #3 remedy will incorporate the requirements of this ARAR.

b. Part 55 of the Natural Resources and Environmental Protection Act, PA 451 of 1994, as amended, (formerly Act 348 of the Public Acts of 1965, as amended, Air Pollution Act); Administrative Rules Parts 7 and 9:
This establishes standards for the emission of regulated contaminants into the air. The fundamental change to the O.U. #3 remedy evaluated here will require excavation, resulting in agitation of Site

soils, which will result in emissions. Although it is not anticipated that the amended O.U. #3 Remedial Action will stir up excessive airborne material, this RA may require some degree of emissions control during construction. This is applicable to the overall Site air quality and does not account for air releases created by nearby industrial facilities.

For dust control, the most effective method is wet suppression using water alone, or a chemical suppressant in water. This will capture soil particles, and will inhibit migration of volatile and semi-volatile vapor. At the end of each daily construction period, excavation and stockpile areas will be covered appropriately to prevent releases during off-hours. In the event wet suppression alone does not adequately control Site emissions to within required levels, it will be possible to perform further controls as discussed above, including erection of wind screens.

Rule 901 of Part 55 requires that no emissions of an air contaminant can occur in quantities that cause injurious effects to human health or safety. Specifically, the contaminant concentration that corresponds to a 10^{-6} 70 year lifetime cancer risk can not be exceeded at the Site boundary.

The amended O.U. #3 remedy will require excavation and grading of the most highly contaminated plant areas. It is anticipated, however, that real time perimeter Site monitoring and dust control may not be needed. It is expected that the earth work required for this amended O.U. #3 remedy will remain within acceptable Part 55 levels, with the use of emissions control, if needed.

c. Part 201 of the Natural Resources and Environmental Protection Act, PA 451 of 1994, as amended (formerly known as Act 307 of the Michigan Environmental Response Act):

The substantive provisions of Parts 6 and 7 of the

rules promulgated under Act 307 were identified as an ARAR for the remedial action to be undertaken at this Site. These rules provided, inter alia, that remedial action be protective of human health, safety and the environment by a degree of cleanup conforming to one or more of three cleanup types; Type A, B, and C. The ROD and the amended ROD determined that the selected soil remedy would satisfy Act 307 soil cleanup standards. The Act 307 standards have since been replaced by new standards under Part 201.

The amended Part 201 now defines cleanup standards according to categorical criteria that define the nature of future land use at the site for which Remedial Action is necessary. Specific cleanup categories are: residential, commercial, recreational, industrial, limited residential, limited commercial, limited recreational, limited industrial, and other land use based or limited categories as established by MDEQ. Part 201 groundwater standards will be considered ARARs for determination of long term groundwater cleanup goals.

Implementation of the amended O.U. #3 remedy will limit future development of Site property to industrial use. The Site constitutes an inactive or abandoned site whose primary activity was industrial in nature and as such can continue to be classified as industrial. U.S. EPA foresees that appropriate deed restrictions combined with standard security measures will prevent or limit the exposure potential for nearby residents and will guarantee that the Site is not used for anything except industrial activity. Thus, Part 201 industrial cleanup criteria would be the relevant ARAR.

Part 201 requires that remedial action cleanup criteria meet a 10^{-5} carcinogenic risk level, or for non-carcinogenic substances, a hazard quotient of 1.0. Because it will remove contaminated soils to acceptable Part 201 soils levels, implementation of the amended O.U. #3 remedy would meet or exceed this standard for Site soils and ultimately, Site groundwater.

d. Part 111 of the Natural Resources and Environmental Protection Act, PA 451 of 1994, as amended, (formerly Michigan Hazardous Waste Management Act, PA 64):
Discrete portions of Part 111 of NREPA may not be relevant and appropriate at the Site. Because there will be no on-Site containment of wastes, substantive portions of Part 111 which deal with the design and construction of hazardous waste covers are not ARARs. Similarly, substantive requirements for liners and leachate collection systems are not relevant and appropriate. Disposal of excavation spoils, however, will meet RCRA requirements as previously described.

OTT/STORY/CORDOVA SUPERFUND SITE - OPERABLE UNIT THREE:
MUSKEGON, MICHIGAN
AMENDMENT TO THE RECORD OF DECISION

APPENDIX B - RESPONSIVENESS SUMMARY

This Responsiveness Summary has been prepared in order to provide answers to the public concerns regarding the cleanup plan for on Site soils (O.U. #3). This Responsiveness Summary also meets the requirements of Sections 113(k)(2)(B)(iv) and 117(b) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the Superfund Amendments and Reauthorization Act of 1986 (CERCLA), which requires the United States Environmental Protection Agency (U.S. EPA) to respond to comments received on a proposed plan for remedial action. A notice of availability of the administrative record and proposed plan was published in the Muskegon Chronicle on May 27, 1997. This Responsiveness Summary addresses concerns expressed during the subsequent public comment period of May 27 through June 25, 1997. In addition, a public meeting to discuss the proposed plan was held on June 3, 1997 at the Dalton Township Hall and comments recorded at the meeting are addressed in this Responsiveness Summary. Some of the comments appearing below have been paraphrased for brevity. The Administrative Record contains copies of written comments and the transcript from the June 3rd a public meeting.

COMMENT:

U.S. EPA should construct an on-Site landfill structure that includes a certain area across River Road, pump out water from excavation areas, and try to identify non-identifiable contaminants.

U.S. EPA's RESPONSE:

U.S. EPA has already considered the possibility of constructing an on Site containment structure within the remedy alternatives decision analysis contained in the original Record of Decision (ROD) signed in 1993. At that time, the cost estimate for such a structure was comparable to the Low Temperature Thermal Desorption (LTTD) option ultimately selected. Because LTTD technology changes contaminants to more benign compounds and

elements, it afforded a more permanent solution than containment, which simply confines wastes for management at a later time. In addition, some members of the community expressed a distaste for an on Site containment remedy.

In considering possible remedial alternatives for this ROD Amendment, U.S. EPA re-visited the possibility of on-Site containment. The capital cost that would be required for such containment is not warranted given the small volume of soils constituting the primary risk. The 1993 ROD cost comparison between alternatives remains valid. That is, had new estimates been calculated, there would still be an identical magnitude of cost difference between on Site containment and LTTD, even though actual values would have changed due to inflation.

For example, in the 1993 ROD, Alternative 3b was construction of an on-Site Act 64 / RCRA compliant landfill with excavation and placement of 7,200 cubic yards of material. The estimated capital cost was $ 10,400,000, or approximately $ 1,444 per cubic yard. Alternative 6 was LTTD treatment of 7,200 cubic yards for a capital cost of $ 6,800,000. U.S. EPA discovered during implementation that this cost would actually be $ 12,200,000, or $ 1,694 per cubic yard. A cursory adjustment of these estimates to the year 1997 (accounting for inflation) increases both numbers by 3 percent per year for 4 years (a factor of 1.13), to $1,625 per cubic yard for an on-Site landfill and $1,914 per cubic yard for LTTD. These can be compared to the current estimate of $ 4,050,000 (for 4,000 cubic yards) which is $ 1,013 per cubic yard. Because the regulatory and design requirements of both an on-Site containment structure and treatment are still the same in year 1997 as in year 1993, these relative comparisons are still valid. In addition, the smaller volume of soils to be addressed make both an on-Site containment alternative and a treatment alternative not cost effective.

During the Remedial Action described in this ROD Amendment, excavation areas will have any water pumped out in accordance with normal excavation procedures. This may assist in the remediation of contaminated groundwater. However, the primary mechanism dealing with contaminated water continues to be extraction wells pumping to the treatment plant.

The term 'non-identifiable' refers to a limitation of laboratory

analytical equipment whereby compounds with similar properties can not be distinguished from one another. U.S. EPA has determined that the proposed excavation areas contain contaminants that constitute the primary risk as well as non-identifiable compounds. If there are non-identifiable compounds in those areas, they will be handled identically to contaminants identified as presenting primary risk.

COMMENT:

Several commenters disagreed with using revised State of Michigan soil cleanup standards as a basis for amending the O.U. #3 remedy. The scope of the Remedial Action must be based on addressing Site health risks and not a (potentially less protective) changing regulation.

U.S. EPA's RESPONSE:

Revised State standards are only a contributing factor to U.S. EPA's decision to amend the remedy. As noted in the ROD Amendment, cost effectiveness and future land use were also considered in light of the cost increase shown for LTTD treatment. Treating soils by LTTD, then back-filling excavated areas with acceptable residue is not cost effective when compared against using soil from an already clean source. Although newly clean filled areas may be re-contaminated by contaminated groundwater, a significant cost savings is realized by not implementing LTTD, and the Site returns to a state suitable for industrial re-use. The areas identified as presenting an unacceptable risk will continue to be addressed as in the 1993 ROD, but other areas with risks now deemed acceptable for industrial use are being removed from the scope of the remedy.

After consideration of the location and likely future land use for the Ott/Story/Cordova site, it is more appropriate to remediate the Site in keeping with future industrial or commercial land use. Tables 4 through 4E (Summary of Site Risks) of the ROD Amendment shows the primary O.U. #3 risk driving the Remedial Action is cumulative risk to Site workers attributed to all Site contaminants including Dioxin, which was detected in Areas F and G during earlier Site sampling events.

COMMENT:

Several commenters noted that the removal of contaminated sediments in the Little Bear Creek system should occur regardless of any other considerations.

U.S. EPA'S RESPONSE:

This amended remedy has not eliminated future implementation of Remedial Action for Creek sediments. Previous Creek data and risk calculated therefrom presented a picture at the time of the 1993 ROD that does not reflect current decreases in sediment contamination. U.S. EPA is postponing any Creek excavation and dredging activity (and expenditure) until the effectiveness of all Site remediation to date has been determined. Rather than initiate an intrusive Remedial Action on Creek sediments and possibly disrupt the natural configuration of the Creek system, the mitigating effect of the groundwater extraction and treatment system should first be measured in order to define the most effective strategy for the Creek. As is the case at the Bofors-Nobel Site, revival of the Creek system may occur naturally if contaminated groundwater is intercepted before reaching the Creek. U.S. EPA and MDEQ are also investigating the possibility of recirculating clean treated groundwater back into the Creek system to assist in attenuation of contaminants.

COMMENT:

Results of Creek sediments and surface water sampling should be made available for review by the community.

U.S. EPA'S RESPONSE:

U.S. EPA will add all such Creek surface water and sediments data to the Administrative Record and the Site Information Repository on a regular basis.

COMMENT:

The government has not stated a valid legal basis for proceeding with the amended remedy. EPA uses State standards as a basis, yet Areas F and G meet State cleanup standards. There is no legal support anywhere in the Administrative Record for basing a

remediation decision on the nature of past activities or unspecified environmental damage and no valid basis exists under either CERCLA or the NCP.

U.S. EPA'S RESPONSE:

This amended ROD is consistent with and nearly identical to the alternative remedy proposed by these commenters during the 1993 public comment period for the original ROD. By re-evaluation of future land use and the associated remediation goals and risks, U.S. EPA is demonstrating innovation and believes this amended O.U. #3 remedy is a more reasonable approach and reflects a faster, fairer, more efficient Superfund program.

Document #3 of Update #9 to the O.U. #3 Administrative Record is a Technical Memo presenting the Risk Assessment for the O.U. #3 area. This memo includes tables included in this ROD Amendment showing risk levels for future workers and residents in exceedance of the 10^{-4} carcinogenic and 1.0 Hazard Index limits established by CERCLA and the NCP. The State of Michigan is also required by law to take action at levels such as these.

40 CFR Section 300.430 (e)(2)(i)(A) requires U.S. EPA to establish remediation goals based on ARARs and additional factors including "...factors related to uncertainty; and (5) [O]ther pertinent information." The history of the Site in Areas F, G, and R, the unacceptable cumulative Site risk, and the historical exceedances of cleanup standards is enough basis to warrant soil removal in those areas. Further, in Areas G and R, specific visual confirmation of soil discoloration and stressed vegetation by EPA contractors and the results of Microtox testing demonstrate an unacceptable threat to the environment.

COMMENT:

RCRA must be both relevant and appropriate (dependent on site specific considerations) in order to be imposed at this Site, and not made an ARAR based on conceptual relevance alone. "Relevant and appropriate" requirements are clean-up standards or other requirements promulgated under Federal or State law that, while not legally applicable to the remedial action, address problems or conditions sufficiently similar to those encountered at the Site.

U.S. EPA'S RESPONSE:

RCRA is applicable in determining disposal fate of any excavation spoils. Sampling and analysis will be performed during the Remedial Action to determine the required disposal destination. The ROD Amendment establishes off-Site landfilling as the disposal option, but if it is determined that excavated material demonstrates RCRA characteristics in exceedance of Land Disposal Restriction treatment standards, it must be treated before disposal in a RCRA licensed hazardous waste landfill, or incinerated at an appropriately licensed off-Site incinerator, regardless of costs. Conversely, if it is determined that excavation spoils can be disposed in a more cost effective, 'non-hazardous' manner, U.S. EPA will dispose of them as such.

COMMENT:

The RCRA Universal Treatment Standard (UTS) is not an ARAR for this site and thus U.S. EPA is not warranted applying it by requiring testing of the soils to determine whether Dioxin and Furan levels exceed the RCRA UTS. Applying the UTS to site soils would conflict with EPA's own guidance on determining whether RCRA requirements are relevant and appropriate for the site - dioxin levels in these soils pose no realistic threat to human health or the environment if landfilled, making incineration unnecessary.

U.S. EPA'S RESPONSE:

The commenter fails to provide a basis to support the statement that Dioxin levels in Site soils pose no threat to human health or the environment. RCRA is applicable to the determination of appropriate disposal facilities for excavation spoils demonstrating appropriate substantive characteristics. Conversely, a more cost effective 'non-RCRA' disposal method will be used if possible.

COMMENT:

Area R should not be excavated based on one residential drinking water exceedance of a single leachate analysis. Any concern regarding possible impact on groundwater from Area R is misplaced. Rainwater has percolated for over 20 years and it is

obvious that the soil is no longer contributing to groundwater contamination. Even if the contaminant leaches into the groundwater it would have no measurable impact on the groundwater remedy already in place and operating at the Site.

U.S. EPA'S RESPONSE:

As previously stated, 40 CFR Section 300.430 (e)(2)(i)(A) requires U.S. EPA to establish remediation goals based on ARARs and additional factors including "...factors related to uncertainty; and (5) [O]ther pertinent information." Visual confirmation by EPA contractors of foreign substances (such as drum remnants and discoloration) in Area R native soil and the known history of the area as a disposal area are part of the basis for excavation of Area R. Further, State of Michigan cleanup standards require 20 times the industrial drinking water standard to be used as a remediation goal. Analytical data for samples from Area R have been in exceedance of this standard.

The commenter fails to support the statement that the soil is no longer contributing to groundwater contamination. The fact that contaminants identified in soils continue to be discovered in groundwater being extracted and treated demonstrates the likelihood that soils are still contributing to groundwater contamination. The presence of these contaminants results in continued (possibly perpetual) extraction and treatment, which would be inconsistent with O.U. #2 and unnecessarily increases the cost of groundwater remediation. Also, the basis for this comment is seemingly inconsistent with the commenter's recent correspondence to U.S. EPA requesting the immediate cessation of all groundwater remediation efforts.

COMMENT:

The costs for the work described by U.S. EPA should be significantly less than the cost estimate shown in the Proposed Plan.

U.S. EPA'S RESPONSE:

As stated in this ROD Amendment, the $5,600,000 present worth estimate is an allowance that covers a worst-case scenario and is used here merely as a means to compare alternatives. U.S. EPA

fully anticipates that the actual costs realized during implementation of the amended remedy will be less based on the actual soil volumes excavated and the nature of the final spoils disposal (RCRA hazardous, non-hazardous, or incineration). A firm determination of Remedial Action costs can not be made until implementation of the amended remedy begins.

COMMENT:

U.S. EPA's proposed monitoring of creek sediments is excessive. Costs noted by U.S. EPA should be approximately 4 times less than what was estimated.

U.S. EPA'S RESPONSE:

Again, U.S. EPA's estimate is an allowance that includes an appropriate contingency for any needed variances in the surface water and sediment monitoring plan.

COMMENT:

The amended remedy as described in the Proposed Plan is letting the responsible companies off easy. EPA should enforce the treatment method that is most effective in returning the soil and groundwater to its virgin state as quickly as possible regardless of costs.

U.S. EPA'S RESPONSE:

Although potentially responsible parties identified for the Site continue to dispute their responsibility for the contamination and clean up costs, the U.S. Government continues its effort to reclaim funds spent at the Site. U.S. EPA, however, as a steward of public funds must be judicious in making decisions on where and how much money is spent on remedies.

COMMENT:

What has changed since 1993 when MDNR supported LTTD and sediments removal ? Why does one of the worst sites in the county now merit a minimal cleanup ? The commenter does not support the proposed amended remedy and protests the lack of cleanup at this site.

U.S. EPA's RESPONSE:

Justification for Remedial Action at this Site is the unacceptable risk to a future Site worker (1 in 10,000 chance of cancer over 70 years from cumulative effects of contaminants, including the possibility of Dioxin). The areas denoted for removal by the amended remedy will remove contaminants from O.U. #3 soils and dispose of them off-Site, including incineration if required. What will remain after the amended remedy is completed are marginally contaminated soils covered with a 1 to 3 foot depth of clean soil. If anyone were to perform any future excavation, soils 1 to 3 feet below grade may present a 1 in 100,000 chance of an individual developing cancer if that individual performs industrial work on the Site for 70 years. U.S. EPA is required to perform a Remedial Action when the cancer risk is 1 in 10,000 or worse (1 in 1,000, 1 in 100, etc.). In accordance with current regulations, the acceptable range of risk is between 1 in 10,000 (10^{-4}) and 1 in 1,000,000 (10^{-6}) over a 70 year life time.

In the O.U. #3 ROD, the decision analysis demonstrated comparable risk reduction and costs between several containment options and LTTD. U.S. EPA selected LTTD primarily because of the preference for treatment. Unfortunately, the LTTD estimate used in the comparison did not adequately encompass the requirements needed for Site preparation and other LTTD support costs. In 1993, the groundwater extraction and treatment system was not operating and there was no reduction in Creek contamination as there is today. Consequently, the State of Michigan concurred with the decision to reconsider the O.U. #3 remedy based on concerns with possible excessive expenditure and the desire to more accurately gauge the benefits of groundwater extraction and treatment over an adequate enough time period.

Although the Ott/Story/Cordova site represents one of the higher overall risk Superfund sites in the State of Michigan, the remote location of the Site, the Site's reputation as a contaminated area, and the historical remedial and removal actions to date have mitigated the situation whereby U.S. EPA and the State can reconsider the highly conservative goals established in the O.U. #3 ROD and tailor them to reflect a more innovative, 'real world' approach. In this case, the Site would be used for some industrial use after the Remedial Action is complete.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5

DATE: Wednesday, September 17, 1997

SUBJECT: TRANSMITTAL OF THE OTT/STORY/CORDOVA SUPERFUND SITE AMENDMENT TO THE RECORD OF DECISION FOR THE THIRD OPERABLE UNIT

FROM: Wendy L. Carney, Chief
Remedial Response Branch #1

Bertram C. Frey 9/19/97
Bertram C. Frey
Acting Regional Counsel

TO: William E. Muno, Director
Superfund Division

Enclosed for your review and signature is the Ott/Story/Cordova Site Amendment to the Record of Decision for Operable Unit #3. The Amendment includes the Declaration, Decision Summary, and Responsiveness Summary. The latest update to the Administrative Record is also included and additional documents will be added shortly.

We concur with the amended Remedial Action for the third operable unit for the Ott/Story/Cordova site, which eliminates Low Temperature Thermal Desorption (LTTD) treatment of O.U. #3 soils and Little Bear Creek sediments and provides protection of human health and the environment through excavation and disposal of contaminated soils and monitoring of Little Bear Creek surface water and sediments.

Please feel free to contact us if you have any questions.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 5

DATE: Wednesday, February 25, 1998

SUBJECT: TRANSMITTAL OF THE OTT/STORY/CORDOVA SUPERFUND SITE AMENDMENT TO THE RECORD OF DECISION FOR THE THIRD OPERABLE UNIT

FROM: Wendy L. Carney, Chief
Remedial Response Branch #1

Bertram C. Frey
Acting Regional Counsel

TO: William E. Muno, Director
Superfund Division

Enclosed for your review and signature is the Ott/Story/Cordova Site Amendment to the Record of Decision for Operable Unit #3. The Amendment includes the Declaration, Decision Summary, and Responsiveness Summary. The latest update to the Administrative Record is also included and additional documents will be added shortly.

We concur with the amended Remedial Action for the third operable unit for the Ott/Story/Cordova site, which eliminates Low Temperature Thermal Desorption (LTTD) treatment of O.U. #3 soils and Little Bear Creek sediments and provides protection of human health and the environment through excavation and disposal of contaminated soils and monitoring of Little Bear Creek surface water and sediments.

Please feel free to contact us if you have any questions.

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U.S. ENVIRONMENTAL PROTECTION AGENCY
REMEDIAL ACTION

ADMINISTRATIVE RECORD
FOR
OTT/STORY/CORDOVA SUPERFUND SITE
MUSKEGON, MICHIGAN

OPERABLE UNIT #3
UPDATE #13

MAY 21, 1997

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1	12/14/94	Fluor Daniel, Inc./Black & Veatch Waste Science, Inc.	U.S. Army Corps of Engineers/ Omaha District	Conceptual Design for the Low Temperature Thermal Desorption Treatment System for OU#3 at the Ott/Story/ Cordova Site	122
2	03/00/95	U.S. Army Corps of Engineers/ Omaha District	U.S. EPA	Drawings: Low Temperature Thermal Desorption (LTTD) Treatment System for OU#3 at the Ott/ Story/Cordova Site	19
3	04/00/95	Fluor Daniel, Inc./Black & Veatch Waste Science, Inc.	U.S. Army Corps of Engineers/ Omaha District	Predesign Investigation Report for OU#3 Remedial Design at the Ott/Story/ Cordova Site: Volume 1 (Report and Appendices A-C)	165
4	04/00/95	Fluor Daniel, Inc./Black & Veatch Waste Science, Inc.	U.S. Army Corps of Engineers/ Omaha District	Predesign Investigation Report for OU#3 Remedial Design at the Ott/Story/ Cordova Site: Volume 2 (Report and Appendices D-E)	330
5	05/18/95	Black & Veatch, Inc.	U.S. EPA Region 5	Evaluation of Cleanup Criteria Report for OU#3 at t Ott/Story/Cordova Site	25
6	05/19/95	Lavis, B., U.S. EPA	Palensky, J., U.S. Army Corps of Engineers/ Omaha District	Letter re: U.S. EPA Request for Design Modifications for OU#3 at the Ott/Story/Cordova Site	1
7	05/22/95	McMahon, T., Sidley & Austin	Johnson, L., U.S. EPA	Letter re: Request for U.S. EPA to Reconsider LTTD Remedy for OU#3 at the Ott/Story/Cordova Site	4
8	06/00/95	Roy F. Weston, Inc.	U.S. Army Corps of Engineers	Sampling and Analysis Plan for Low Temperature Thermal Desorption for OU#3 at the Ott/Story/ Cordova Site	771

NO.	DATE	AUTHOR	RECIPIENT	TITLE/DESCRIPTION	PAGES
9	06/00/95	Roy F. Weston, Inc.	U.S. Army Corps of Engineers	Work Plan for Low Temperature Thermal Desorption for OU#3 at the Ott/Story/Cordova Site	290
10	06/02/95	Earth Tech	CPC International and Aerojet General/ Cordova Chemical Company	Review of Low Temperature Thermal Desorption Treatment and Revised Cleanup Standards for OU#3 at the Ott/Story/ Cordova Site (DRAFT)	38
11	06/26/95	Foster, D., U.S. Army Corps of Engineers/ Grand Haven	Peden, D., Cordova Chemical Company	Letter re: Ott/Story/ Cordova OU#3 Construction Schedule w/Attached Weston LTTD Construction Schedule	6
12	07/27/95	Lavis, B., U.S. EPA	Foster, D., U.S. Army Corps of Engineers/ Grand Haven	Letter: Stop Work Order for IAG DW96947723-01-0 for OU#3 at the Ott/Story/ Cordova Site	1
13	08/00/95	Earth Tech	CPC International and Aerojet General/ Cordova Chemical Company	Soil Sample Collection and Analysis at the Ott/ Story/Cordova Site	256
14	09/00/95	Earth Tech	CPC International and Aerojet General/ Cordova Chemical Company	Review of Revised Cleanup Standards and Low Temperature Thermal Desorption Treatment for OU#3 soils at the Ott/ Story/Cordova Site	20
15	09/22/95	McMahon, T.; Sidley & Austin	Johnson, L., U.S. EPA	Letter re: Comments on OU#3 Remedy at the Ott/ Story/Cordova Site	12
16	03/13/96	Eagle, D., MDEQ	Fagiolo, J., U.S. EPA	Letter re: Ott/Story/ Cordova OU#3 and Little Bear Creek Sediment Cleanup	3
17	04/00/97	Black & Veatch Special Projects, Corp.	U.S. EPA Region 5	Technical Memorandum for Soil and Sediment at the Ott/Story/Cordova Site	112
18	05/00/97	U.S. EPA	Public	Proposed Plan for the Ott/Story/Cordova Superfund Site	8